ERIODICAL
Fib/R20

LIBRARY
DEC 1 1965
FISH & WILDLIFE SERVICE

Report of the Second Session

# ADVISORY COMMITTEE ON MARINE RESOURCES RESEARCH

Rome, 6-12 February 1964

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
Rome, 1964

## FAO FISHERIES REPORTS

A series of reports of meetings, surveys and other activities of FAO Fisheries Division. Other recent documents in this series are:

| | | | |
|---|---|---|---|
| FIb/R6.4 | | Proceedings of the world scientific meeting on the biology of tunas and related species, Vol. 4 - bibliography<br>Actes de la réunion scientifique mondiale sur la biologie du thon et des espèces voisines, Vol. 4 - bibliographie<br>Actas de la reunión científica mundial sobre biología del atún y especies afines, Vol. 4 - bibliografía | 1964 |
| FIe/R7 | | Report of the third session — continuing working party on fishery statistics in the North Atlantic area | 1963 |
| FIe/R8 | | Landing and marketing facilities at selected sea fishing ports (Preliminary draft) | 1963 |
| FIt/R9 | | Standards and requirements for fish handling, processing, distribution and quality control | 1963 |
| FIe/R10 | (En) | Proceedings and basic working papers of the technical meeting on fishery co-operatives, Naples, 12-21 May 1959 | 1963 |
| FIt/R11 | (En) | Report of the second world fishing gear congress, London, 25-31 May 1963 | 1963 |
| FIt/R11 | (Fr) | Rapport du deuxième congrès mondial des engins de pêche, Londres, 25-31 mai 1963 | 1963 |
| FIt/R11 | (Es) | Informe del segundo congreso mundial de artes de pesca, Londres, 25-31 mayo 1963 | 1963 |
| FI/R12 | | Informe de la primera reunión de la comisión asesora regional de pesca para el Atlántico sud-occidental (CARPAS) | 1964 |
| FIb/R13 | (En) | Report of the FAO working party for rational utilization of tuna resources in the Atlantic ocean: first session, Fao, Rome, 25-30 October 1963 | 1963 |
| FIb/R13 | (Fr) | Rapport du groupe de travail FAO sur l'utilisation rationelle des ressources thonières de l'océan Atlantique: première session, FAO, Rome, 25-30 octobre 1963 | 1963 |
| FIb/R13 | (Es) | Informe del grupo de trabajo de la FAO sobre aprovechamiento racional de los recursos atuneros del océano Atlántico: primer período de sesiones, FAO, Roma, 25-30 octubre 1963 | 1963 |
| FIb/R14 | (En) | Report of the first session of the advisory committee on marine resources research, Rome, 28 January-2 February 1963 | 1963 |
| FIb/R14 | (Fr) | Rapport de la première session du comité consultatif de la recherche sur les ressources de la mer, Rome, 28 janvier-2 février 1963 | 1963 |
| FIb/R14 | (Es) | Informe de la primera reunión del comité asesor sobre investigaciones de los recursos marinos, Roma, 28 enero-2 febrero 1963 | 1963 |
| FIe/R15 | | La industria pesquera en el Uruguay (distribución limitada) | 1963 |
| FIe/R16 | | Report to the Government of Saudi Arabia on the organization of fisheries operations on the Red Sea Coast | 1964 |
| FIt/R17 | (En) | Report of the FAO fishing vessel stability meeting, Gdansk, Poland, 7-14 October 1963 | 1964 |
| FIt/R17 | (Es) | Informe de la reunión de la FAO sobre estabilidad de los barcos pesqueros; Gdansk, Polonia: 7-14 octubre 1963 | 1964 |
| FIb/R18 | (En) | Report of the first session of the FAO expert panel for the facilitation of tuna research, Rome, 8-12 June 1964 | 1964 |
| FIb/R18 | (Fr) | Rapport de la première session du groupe d'experts FAO chargé de faciliter la recherche sur le thon, Rome, 8-12 juin 1964 | 1964 |
| FIb/R18 | (Es) | Informe del primer período de sesiones del cuadro de expertos de la FAO para la facilitación de las investigaciones sobre el atún, Roma, 8-12 junio 1964 | 1964 |
| FIt/R19 | (En) | Report of the symposium on the significance of fundamental research in the utilization of fish, Husum, Federal Republic of Germany, 26-30 May 1964 | 1964 |
| FIb/R20 | (En) | Report of the second session of the advisory committee on marine resources research, Rome, 6-12 February 1964 | 1964 |

Unserialized reports dated earlier than January 1962 and earlier documents in this series are listed in the FAO Catalogue of Fisheries Publications and Documents (1963). Certain unserialized reports may be reprinted in this series as the unserialized versions go out of print.

# REPORT OF THE SECOND SESSION OF THE ADVISORY COMMITTEE ON MARINE RESOURCES RESEARCH

Rome, 6 - 12 February 1964

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
Rome, December 1964

PREPARATION OF THIS REPORT

This document is the Report of the Second Session of the Advisory Committee on Marine Resources Research, held in Rome, 6 - 12 February 1964.

Distribution:

FAO Fisheries Division
FAO Regional Fisheries Officers
Members of ACMRR
FBCB Selector 5
Member Countries
IOC

"Current Bibliography" Entry:

ACMRR(FAO). Second Session, Rome, 6-12 February 1964 (1964)
FAO Fish.Rep., (20):54 p.
Report of the second session of the Advisory Committee on Marine Resources Research.

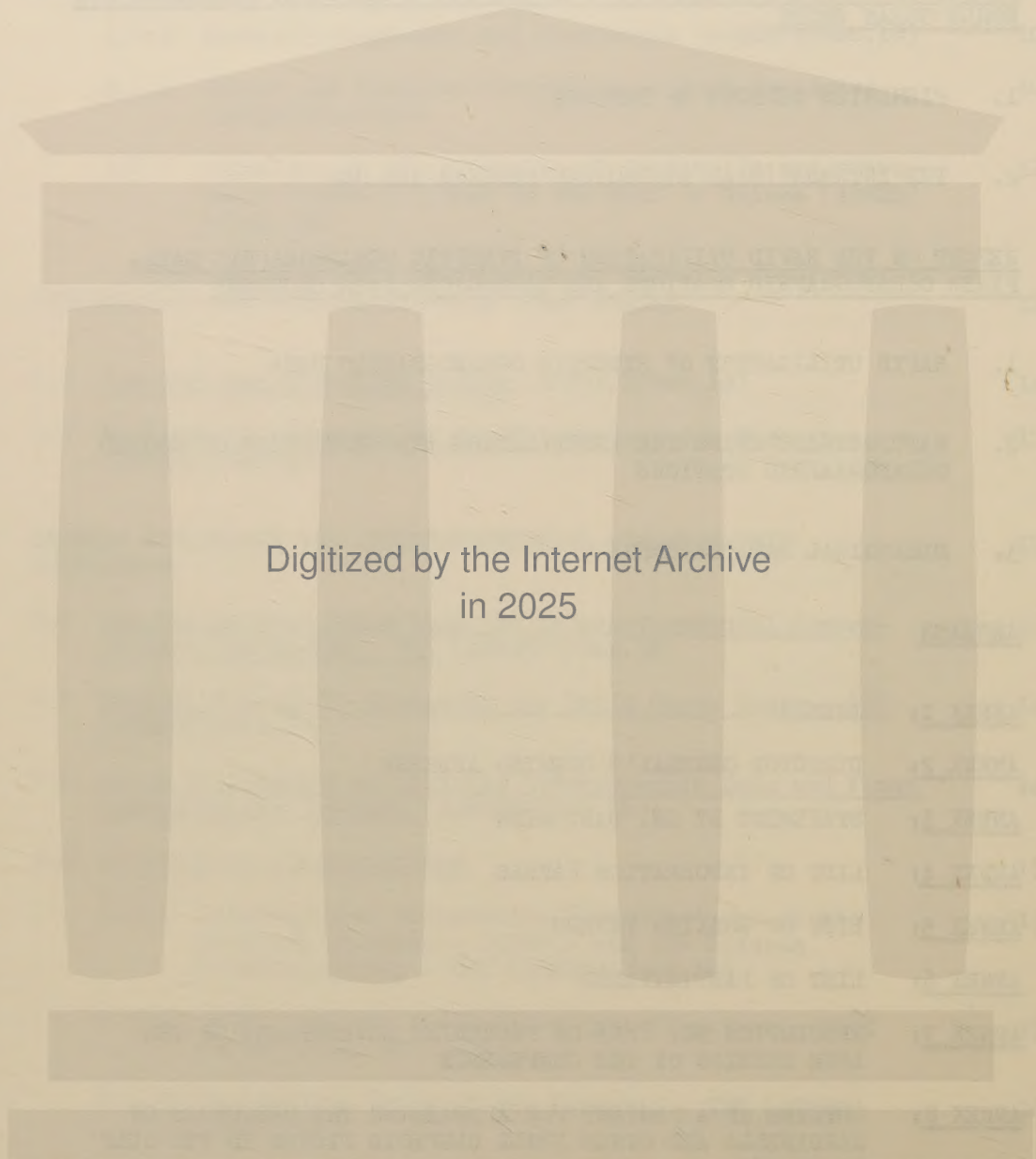
Reports implementation of recommendations of the 1st Session. Gives guide lines for future programs, Fisheries Division's program of work for 1964-65 in the field of marine resources research and management, coordination and cooperation with other bodies, matters concerning the IOC. Appends Director General's opening speech, statement by Dr. D.B. Finn, list of papers presented, list of participants, resolution on fisheries development of the 12th Session of the Conference and outline of a project for appraising the resources of Sardinella and other small clupeoid fishes in the Gulf of Guinea.
Pr 62-092me and 62-093me.

C O N T E N T S


| | | Page no. |
|---|---|---|
| I | GENERAL REPORT | 1 |
| 1. | PROCEDURAL MATTERS | 1 |
| 1.1 | Opening Session | 1 |
| 1.2 | Election of Vice-Chairman | 1 |
| 1.3 | Adoption of the Agenda | 2 |
| 2. | IMPLEMENTATION OF RECOMMENDATIONS OF THE FIRST SESSION | 2 |
| 3. | GUIDE LINES FOR FUTURE PROGRAMS | 2 |
| 3.1 | General Aspects of Future Development (ACMRR/2/Rec.1) | 3 |
| 3.2 | Maintaining the Scientific Competence of Staff (ACMRR/2/Rec.2) | 4 |
| 4. | FISHERIES DIVISION PROGRAM OF WORK FOR 1964-65 IN THE FIELD OF MARINE RESOURCES RESEARCH AND MANAGEMENT | 5 |
| 4.1 | Intelligence on Current Research Activities | 6 |
| 4.1.1 | Publication of Serial Documents Giving Current Information about Marine Resources Research (ACMRR/2/Rec.3) | 6 |
| 4.1.2 | Annual Reviews in the Field of Marine Science (ACMRR/2/Rec.4) | 7 |
| 4.2 | Synopses of Information | 7 |
| 4.2.1 | Species Synopses (ACMRR/2/Rec.5) | 7 |
| 4.2.2 | Fishermen's Charts (ACMRR/2/Rec.6) | 7 |
| 4.3 | Organization of Research, Education and Training | 8 |
| 4.3.1 | Manuals | 8 |
| 4.3.2 | World Seminar on Fisheries Administration (ACMRR/2/Rec.7) | 8 |
| 4.4 | Intercalibration and Standardization of Methods and Instruments (ACMRR/2/Rec.8) | 9 |
| 4.5 | Meetings | 9 |
| 4.5.1 | World Scientific Meetings (ACMRR/2/Rec.9) | 9 |

| | | Page no. |
|---|---|---|
| 4.5.2 | Symposium on Tropho-dynamics of Marine Communities (ACMRR/2/Rec.11) | 10 |
| 4.6 | Development and Assistance in Stock Assessment | 10 |
| 4.6.1 | Resource Assessment and Statistics (ACMRR/2/Rec.10) | 10 |
| 4.6.2 | Direct and Speedier Estimation of Fish Abundance (ACMRR/2/Rec.12) | 10 |
| 4.6.3 | Appraisal of the Resources of Sardinella and other small Clupeoid Fishes in the Gulf of Guinea (ACMRR/2/Rec.13) | 11 |
| 5. | COORDINATION AND COOPERATION WITH OTHER BODIES | 11 |
| 5.1 | FAO Regional Fisheries Bodies (ACMRR/2/Rec.14) | 11 |
| 5.2 | Booklets on Oceanography and Metereology for Fishermen (ACMRR/2/Rec.15) | 12 |
| 6. | MATTERS CONCERNING THE INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION | 13 |
| 6.1 | General Matters Concerning the Intergovernmental Oceanographic Commission - IOC (ACMRR/2/Rec.16) | 13 |
| 6.2 | General Scientific Framework for World Ocean Study - GSF (ACMRR/2/Rec.17) | 14 |
| 6.3 | Rapid Utilization of Synoptic Oceanographic Data and Fixed Oceanographic Stations (ACMRR/2/Rec.18) | 14 |
| 6.4 | Cooperative Investigations | 15 |
| 6.4.1 | International Cooperative Investigations of the Tropical Atlantic - ICITA - and the Guinean Trawling Survey - GTS (ACMRR/2/Rec.19) | 15 |
| 6.4.2 | South Atlantic Cooperative Investigations - SACI (ACMRR/2/Rec.20) | 15 |
| 6.4.3 | Cooperative Study of the Kuroshio - CSK (ACMRR/2/Rec.21) | 16 |
| 6.5 | Second International Oceanographic Congress (ACMRR/2/Rec.22) | 16 |
| 7. | DATE AND PLACE OF THIRD SESSION (ACMRR/2/Rec.23) | 16 |
| 8. | OTHER BUSINESS | 17 |
| 8.1 | Organization and Establishment of Working Groups (ACMRR/2/Rec.24) | 17 |

| | | Page no. |
|---|---|---|
| | 9. ADJOURNMENT | 17 |
| II | REPORT ON FISHERIES ASPECTS ON THE GENERAL SCIENTIFIC FRAMEWORK FOR WORLD OCEAN STUDY | 18 |
| | 1. FISHERIES ASPECTS OF THE GSF | 18 |
| | 2. THE INTERNATIONAL BIOLOGICAL PROGRAM AND GSF | 24 |
| III | REPORT ON THE RAPID UTILIZATION OF SYNOPTIC OCEANOGRAPHIC DATA, FIXED OCEANOGRAPHIC STATIONS AND BIOLOGICAL DATA EXCHANGE | 26 |
| | 1. RAPID UTILIZATION OF SYNOPTIC OCEANOGRAPHIC DATA | 26 |
| | 2. MATTERS CONCERNING THE INSTALLATION AND PROTECTION OF MOORED OCEANOGRAPHIC STATIONS | 31 |
| | 3. BIOLOGICAL DATA EXCHANGE | 32 |
| IV | ANNEXES | |
| | ANNEX 1: AGENDA | 34 |
| | ANNEX 2: DIRECTOR GENERAL'S OPENING ADDRESS | 36 |
| | ANNEX 3: STATEMENT BY DR. D.B. FINN | 39 |
| | ANNEX 4: LIST OF INFORMATION PAPERS | 43 |
| | ANNEX 5: LIST OF WORKING PAPERS | 45 |
| | ANNEX 6: LIST OF PARTICIPANTS | 47 |
| | ANNEX 7: RESOLUTION NO. 8/63 ON FISHERIES DEVELOPMENT OF THE 12TH SESSION OF THE CONFERENCE | 52 |
| | ANNEX 8: OUTLINE OF A PROJECT FOR APPRAISING THE RESOURCES OF SARDINELLA AND OTHER SMALL CLUPEOID FISHES IN THE GULF OF GUINEA | 53 |



Digitized by the Internet Archive
in 2025

https://archive.org/details/fao-fisheries-and-aquaculture-report_1964_20

# I GENERAL REPORT

## 1. PROCEDURAL MATTERS

### 1.1 Opening Session (Agenda Item 1)

Dr. A. Needler, Chairman of the ACMRR introduced the Director-General of FAO, Dr. B.R.Sen, to the Committee and welcomed the members of the ACMRR and of its Working Groups, and the representatives and observers of international organizations participating in the Second Session of the Committee.

The Director-General addressed the meeting [a], expressing his appreciation for the work done by the Committee since its establishment last year, and stated that he had in mind its recommendations when he put the proposals of the Director of Fisheries Division to the 12th Session of the FAO Conference for the expansion of work in 1964/65. He referred to the favourable reaction of the Conference to these proposals and mentioned specially the resolution calling for a reappraisal of the Fisheries Division's program, mentioning particularly its work in connection with marine resources. Such a reappraisal could lead to new measures which could make FAO in the future the leading inter-governmental body in encouraging the rational harvesting of food from the oceans, and he expressed his desire to have the Committee's suggestions on this matter in relation to the present work of the Organization in the field of research, exploration, conservation and the improvement of resources. The Director-General mentioned at this point the role of the Committee as the advisory body of the Intergovernmental Oceanographic Commission and took the opportunity to offer a special welcome to the two Soviet scientists present, who were appointed on the recommendation of the Bureau of the Commission.

Dr. D.B. Finn, recently retired Director of the Fisheries Division, also addressed [b] the meeting, reviewing the evolution of the pattern of fisheries development throughout the world in recent years and the complex problems that have resulted from the new quantitative and qualitative forms of exploitation of marine natural resources, and he commented on the policy followed and the problems faced by the FAO Fisheries Division as a consequence of this evolution. He then made a few remarks, based on the experience gained during his many years of service with FAO, on the main lines of development that he could foresee in this field and on the organizational questions involved.

The Chairman called the attention of the meeting to some points of the Statutes, particularly those concerning its capacity of advisory body to the Director-General of FAO and to IOC.

### 1.2 Election of Vice-Chairman (Agenda Item 2)

The Chairman requested the Committee to make proposals for the election of a Vice-Chairman to fill the existing vacancy. Dr. D. Cushing proposed for election Dr. D. McKernan. This was seconded by Mr. J. Adjetey, Prof. F. Gneri and Dr. G. Hempel. Dr. McKernan was then elected as Vice-Chairman for the duration of the Second Session by acclamation.

---

a/ The Director-General's address is reproduced in Annex 2 to this Report.
b/ Dr. D.B. Finn's address is reproduced in Annex 3 to this report.

1.3 Adoption of the Agenda (Agenda Item 3)

The Chairman submitted for consideration of the Committee the Provisional Agenda. The Agenda a/ was approved without modification.

In view of the extreme importance of Agenda Item 9 and the request for advice expressed in the opening address of the Director-General of FAO, the Committee decided to give this Item priority in the discussions.

2. IMPLEMENTATION OF RECOMMENDATIONS OF THE FIRST SESSION (Agenda Item 4)

The Secretary gave a general review of the action taken by FAO to implement the recommendations approved at the First Session and pointed out the main achievements and some of the difficulties encountered in the implementation of some of the recommendations. It was decided that the state of implementation of the recommendations should be discussed in detail in conjunction with the pertinent items of the Agenda.

3. GUIDE LINES FOR FUTURE PROGRAMS (Agenda Item 9)

The Chairman invited Mr. Popper to introduce the subject, which he did specifically in the context of the opening address made by the Director-General and Dr. Finn's statement.

First he called attention to Resolution 8 of the 12th Session of the Conference, urging that Fisheries Division be developed into the leading international body for encouraging the rational harvesting of aquatic resources, and indicated how such a development would have to be visualized within the general organization and overall program of FAO. Further, for speedy implementation, it seemed that the Organization's timetable would require the Director-General to be able to present an outline of his proposals by October 1964, i.e., before the Committee could meet again.

The Conference Resolution had emphasized the great need for high quality protein, and it was suggested that the Director-General should view this objective very broadly when making proposals for strengthening the Organization's program in this field. There would necessarily be financial limits to what might be done, although these might be eased by taking into account resources available outside the Regular Program budget. Proposals would also need to recognize the accepted principle that FAO should undertake this work which is not covered by other bodies, either on a continuing basis or at least in the first stage, and the Committee might give valuable advice as to whether its recommendations should be regarded as continuing or initiatory and, in the latter event, for how long.

In distinguishing between the Regular Program and other activities, such as ETAP, Special Fund, etc., Mr. Popper referred to the opportunity the latter offers for expanding and integrating work on production, and also to possible improvements in the use made of regional commissions and offices, both within FAO and outside. He then drew attention to the probably different role FAO would have to play in the "exploration" and "improvement" of resources, in addition to its role in "conservation" matters and asked for guidance as to what needs to be done by FAO in these fields.

---

a/ See Annex 1.

In concluding, he emphasized the importance of securing the support and cooperation of governments, not only in matters such as conservation and improvement, but also in their general relationships with FAO, and in the work and status of Fisheries Division in particular.

A very lively debate took place and two recommendations reflecting the main points of the discussion were adopted.

3.1 General Aspects of Future Development (Agenda Item 9 - ACMRR/2/Rec.1)

The world's living aquatic resources are largely common property and have great potential as a continuing source of high-quality protein food, in much larger quantities than are now harvested. The Committee, however, emphasized the urgent need for better knowledge of these resources on which to base their utilization. In particular it expressed grave concern over the possible effects of the current growth of fishing power. While full rational exploitation of the fish stocks requires increases in fishing effort in many areas, there is great danger that the rapid growth and increasing mobility of fleets will lead to over-fishing of some stocks before research has revealed the limits of their productive capacity. The fishery is international and the basis for rational exploitation can be met only by research, well-coordinated on an international level. In this explosive situation FAO has a major responsibility and a most important part to play.

The Committee noted Resolution No. 8 on Fisheries Development, of the 12th Session of the Conference (Annex 7 to this Report), and the request of the Director-General for advice on the measures needed to enable the Organization to give leadership in the field of the study of the rational exploitation of the world's marine resources. It gave serious consideration to the required program of research, to the steps to be taken to facilitate the application of its results and to the changes in the Fisheries Division which would be necessary to implement such a program.

The Committee recommends that FAO's program of marine resources research be developed with the following objectives of providing:

(i) an appraisal of the living resources of the sea, including estimation of their long-term productive capacities;

(ii) knowledge of the scientific basis for so regulating fishing as to obtain the greatest long-term value to mankind;

(iii) understanding necessary for improving the resources.

The Committee, while placing these objectives in the above order of priority, stresses that all three lines of research must proceed, and indeed are proceeding, concurrently, (i) being well advanced in some areas and (ii) being already needed in some. Although fundamental research necessary for (iii) is now being actively initiated, much time and effort will be required before general application is practicable.

The Committee believes that to reach these objectives, the Organization's program should include a continuation of the types of work now in progress, namely the provision of general technical services to scientists, research agencies and governments, the development of machinery for joint action, and direct aid to governments. While the activities of FAO in this field have been commendable and need to be continued, and in some instances enlarged, the Committee recommends strongly that FAO take immediate steps to develop a world program of marine resources research which would provide a framework for coordination of the activities of regional bodies, national and other research agencies, and which would reveal the gaps remaining to be filled. The Committee

emphasizes that FAO should be able to play a part in filling such gaps by active initiation of, or continuing participation in, research projects with important potential value. Such participation would not only assure that important needs were satisfied but would also help FAO to enlist the services of the high-quality scientists essential to progress and leadership in research on the living resources of the sea. FAO's program in this field must be exciting and stimulating, both to its own personnel and to the rest of the world.

In accordance with the Resolution No. 8 of the 12th Session of the Conference, the Committee suggests that the immediate step to be taken is to prepare a detailed program, including proposals for procedures to be followed in executing it, including consultation with other international fisheries bodies, governments and scientists for this purpose. The Committee recommends that for this purpose a Working Group be established and that it should report to the Third Session of the Committee.

In its tasks, this Working Group would need to bear in mind that the World Program of Marine Resources Research must take account of the General Scientific Framework (GSF) for World Ocean Study in its fishery aspects [see also Rec.17(a)] and that related activities might also be undertaken under the International Biological Program (IBP) of the International Council of Scientific Unions (ICSU) [see also Rec.17(c)].

The Committee stresses that the Biology Branch of the Fisheries Division can carry out the program outlined above only if its status is improved and its personnel and budget increased. More personnel and funds are required to carry out the enlarged program proposed and, indeed, even for full accomplishment of the duties already assigned. Improved status is necessary if its influence is to be strong with other bodies, and it is important to recruitment and morale. The Committee strongly recommends to the Director-General that this Branch be raised to the status of a Division within the Organization and that its personnel and budget be substantially increased.

Lastly, the Committee calls to the Director-General's attention the fact that the above proposals are related to only one aspect of fisheries development, that of research on the living resources of the sea. While this has high priority, and is the task of this Committee, the full utilization of these resources for the benefit of mankind depends equally on the solution of technological, economic and social problems, and for FAO to play a leading role in bringing this about requires concurrent improvement of the position of other parts of the Fisheries Division and, consequently, of the Division as a whole.

3.2 Maintaining the Scientific Competence of Staff (Agenda Item 9 - ACMRR/2/Rec.2)

The Committee draws the attention of the Director-General to the importance of the competence of his scientific staff as an element of the problem of the status of the FAO Fisheries Division. In the Committee's view the effectiveness of the Division's role depends very much upon its staff being highly qualified, up-to-date in their subjects, and having, as a group, a wide range of competence. The Committee believes that this matter of scientific competence affects the value of the staff's work in servicing the various elements of the FAO program, the effectiveness of its collaboration in the activities of technical groups, and the standing of the staff in international meetings. The Committee recommends that, in addition to such measures as have been recommended elsewhere for expanding and strengthening the staff of the FAO Fisheries Biology Branch, the Director-General considers the following types of measures to maintain and strengthen the technical competence of staff:

(i) ensure that this staff should have reasonably frequent opportunities for direct participation in research activities;

(ii) make it easier for staff to take study leave such as would serve in part the purposes of this recommendation, and

(iii) make wider use of short-term appointments, as a means of supplementing the range of scientific competence available to the Branch.

4. FISHERIES DIVISION PROGRAM OF WORK FOR 1964-65 IN THE FIELD OF MARINE RESOURCES RESEARCH AND MANAGEMENT (Agenda Item 5)

Mr. Holt introduced the subject, referring to the points where there have been expansions of the continuing program, e.g. some changes of work or emphasis, or changes in ways of carrying out particular projects, as well as some new activities. He stated that the program for the biennium 1964-65, submitted to the FAO Conference last November, has been elaborated in line with advice given by ACMRR at its First Session. He pointed out that the activities of the FAO Biology Branch cover three main aspects:

(a) The services for fisheries scientists, as individuals or groups, such as bibliographic work, preparation of synopses, general collection and dissemination of information about research, which constitute quite a large part of the present program.

(b) The provision through FAO, of the machinery for joint action of scientists and countries in the light of FAO's Constitution, as an intergovernmental body; this includes provision of secretariat services to regional councils and commissions, ACMRR, working groups, consultants' panels and so on.

(c) The activity, largely conducted under the various field programs (UN Special Fund, EPTA, FFHC), which represent a form of direct specialized assistance to governments or groups of governments.

The policy behind these activities covers particular projects which are expected to continue more or less indefinitely, those which FAO had the responsibility of starting but which may eventually be turned over to other organizations, or carried out in a different way, and the kinds of activity that are more appropriately done by other bodies, e.g. non-governmental organizations.

Under the Sub-items of Item 5 of the Agenda, are the points where there are expansions of the continuing program, some changes of work or emphasis, or changes in ways of carrying out particular projects, as well as some new activities.

Mr. Gertenbach briefly summarized the Fisheries Division's main activities in the field of fisheries statistics, indicating that these fall under two broad but not clearly separable headings: (a) statistical tabulations and publications; (b) statistical standards and services.

He reviewed briefly the work done during the past twelve months and mentioned the publication of Volume XV of the Yearbook of Fishery Statistics, and three numbers of a new series, the FAO Bulletin of Fishery Statistics to be issued from time to time in a limited number of copies to supplement the Yearbooks, to present detailed statistics of regional interest and special tabulations for meetings, etc.

Subsequently, Mr. Gertenbach reviewed an attempt of the Division to obtain from the various countries, catch data for areas (principally those of long distance

fisheries in Atlantic areas off the West Coast of Africa and in the Indian Ocean) not yet covered by existing international bodies such as ICES and ICNAF. He stressed the need for defining more precisely the boundaries of these new fishing areas for statistical purposes. He also indicated the need to obtain advice on the further breakdown of the species for which separate statistics are to be reported. Finally, Mr. Gertenbach completed his survey by indicating further work done in the field of establishing standard definitions and concepts in the field of catch effort data, in close cooperation with ICES and ICNAF. With these bodies FAO has now established a joint inter-agency reporting system. He also reported that proposals have already been made to the GFCM to introduce this system in the Mediterranean and it is also the intention to extend these statistical standards of this reporting system to other fishing areas and regions of the world.

The discussion on matters concerning the Fisheries Division Program of Work for 1964-65 continued with specific items following the Agenda.

4.1 Intelligence on Current Research Activities

4.1.1 Publication of Serial Documents Giving Current Information about Marine Resources Research (Agenda Items 5.1, 6.3 - ACMRR/2/Rec.3)

The Committee noted with appreciation that arrangements have been made to distribute the bibliographic material prepared by FAO to a specialized library in each member country and that UNESCO is now making a contribution to this valuable service.

It also commended the joint preparation by UNESCO and FAO of International Marine Science (IMS). This quarterly newsletter is beginning to fulfil a most important function in keeping scientists and institutions concerned promptly informed about international aspects of marine science, including fisheries research, and the Committee feels that FAO should be making a direct financial contribution to the joint publication of it. International Marine Science is being prepared as a result of a recommendation of the Intergovernmental Oceanographic Commission, which has raised no objection to its publication in only one language.

The Committee expresses its apprehension that a too rigid interpretation of paragraph 7 of the report of the Technical Committee on Fisheries to the 12th Session of the FAO Conference, which refers to "the simultaneous distribution by FAO and publishers commissioned by FAO of all publications and documents, including manuals and bibliographies, in the three working languages of the Organization", might lead in fact to a restriction of international communication between scientists and scientific institutions. The Committee believes that, while upholding both the spirit and constitutional requirement of the use of the official languages, certain specific exceptions need to be made where it is clear that the strict enforcement of such a rule would result in considerable delays in disseminating urgent information and involve unjustified expense, as well as difficulties in concerted actions by international bodies. One of such exeptions should be the preparation of the Current Bibliography for Aquatic Sciences and Fisheries (CBASF), which is increasingly a mechanized operation involving computer processing of information, and for which the use of more than one working language is impracticable.

The Committee recommends that this matter be presented by the Director-General to the FAO Council for consideration with a view to obtaining an interpretation of the rules and criteria for translation and simultaneous distribution in all official languages which would ensure

that the CBASF continues to be made available to scientists, that IMS can be a joint UNESCO/FAO document, and that some other highly technical material of limited interest may also be distributed in its original language to specialists.

4.1.2 Annual Reviews in the Field of Marine Science (Agenda Item 5.2 - ACMRR/2/Rec.4)

The Committee took note of information, furnished by the Secretariat, with regard to the appearance of various "annual reviews" in the general field of marine science and the fact that these publications did not deal with fisheries science as such. In the Committee's view there was a need for some plan, similar to "Recent Advances", for a systematic and cumulative review of research progress in fisheries science. The Committee considers that this is a field in which FAO might take a lead and therefore recommends that the Secretariat:

(i) maintain a watch over activities in publishing review articles in the field of marine science;

(ii) make a study of the need for review work in fisheries science, and of the means by which such need might be met;

(iii) report to the next session of the Committee its findings.

4.2 Synopses of Information

4.2.1 Species Synopses (Agenda Item 5.2 - ACMRR/2/Rec.5)

The Committee discussed the work of the FAO Fisheries Division in preparing synopses of information on the biology of species comprising living aquatic resources and commends the progress made in this field, both in developing an outline for the collection and arrangement of material and in issuing such synopses.

The Committee noted with approval that the publication of similar synopses is being arranged by the Commonwealth Scientific and Industrial Research Organization (CSIRO) of Australia and the U.S. Bureau of Commercial Fisheries on the initiative taken by the Division.

The Committee recommends that this work, having been organized and a system developed for the publication of synopses, should now be progressively transferred to regional fisheries bodies and research institutes, and that appropriate steps be taken by FAO to bring this to the notice of member governments.

The Committee considered the possibility of having a small editorial group for the Species Synopses to ensure their issue on a uniform basis and their improvement in format and outline, especially when they are prepared by different organizations, but it recommends instead that the details be left to the Biology Branch, Fisheries Division on the manner in which its present function of direct responsibility for this work could be changed to one of coordination of efforts by many other agencies.

4.2.2 Fishermen's Charts (Agenda Items 5.2, 7.8 - ACMRR/2/Rec.6)

The Committee discussed the need for average or cumulative information on oceanographic and marine meteorological conditions encompassing important areas of the world ocean. The discussion brought out

clearly that such information was necessary to plan fishing operations and ocean research programs adequately. In addition, such compilations have a great practical application to the expanding fisheries.

The Committee established a Working Group to:

(i) Examine what information is now available and is now in a properly usable form;

(ii) Study where the need is greatest for such maps and summaries;

(iii) Report to the next session of the Committee on how this information could be compiled and presented in adequate form.

It recommends that the members of this Working Group be Mr. A. Lee (Convener), Dr. O. Sette and Prof. M. Uda and that IOC and WMO be invited each to nominate a member.

## 4.3 Organization of Research, Education and Training

### 4.3.1 Manuals (Agenda Item 5.3)

Mr. Holt summarized for the Committee the progress made in the preparation and publication of the "FAO Manuals in Fisheries Science" initiated by the FAO Fisheries Biology Branch. No. 2 in this series will appear in 1964 under the title "Manual of Sampling and Statistical Methods for Fisheries Biology", and it will incorporate, as new chapters, the "Statistical Leaflets" being prepared jointly with ICES. The work on the preparation of the "Manual on Gear Selectivity" as well as on the "Manual on Fish Tagging" is nearing completion. Furthermore, full assistance is being given to the preparation of the "Manual of Methods of Fish Population Analysis" which is expected to be ready for use at the Training Centres in Cronulla and Split in 1964. The publication of the "Manual of Methods in Fisheries Biology" has suffered many delays for various reasons, among them being the fact that many comments on it have been received, and it will have to be revised accordingly. It is hoped that it will be possible to proceed with printing at the end of 1964.

The Committee noted with appreciation the Secretariat's information. Considering that the training of fisheries scientists remains a critical problem for the development of fisheries research and its application throughout the world, and particularly in developing countries, and recognizing the value of Manuals as an important contribution to make available sources of educational materials, the Committee commended FAO on this project and encouraged its continuation.

No formal recommendation was adopted on this item.

### 4.3.2 World Seminar on Fisheries Administration (Agenda Item 5.3 - ACMRR/2/Rec.7)

There was considerable discussion of this project by the Committee. Some members believed that because of the wide diversity of practice in fisheries research administration there was little benefit to be gained by attempting to emphasize methodology in such administration of research. On the other hand, some believed that there was a need to bring together information on existing practices in this field with the view that it would be helpful, especially to developing countries, to have a better understanding of the practices which have built up in various countries with varying degrees of success.

The Committee recommends that inclusion in the World Seminar of a discussion of research administration would be useful if suitably planned.

This discussion should be based on a series of papers, to be prepared by selected people associated both with large research complexes and relatively simple research establishments. The papers should, where possible, follow a common general outline, but not be bound by this; the outline presented by Dr. G.L. Kesteven for consideration by the Committee is suitable for this purpose.

A general introductory paper should also be prepared. This should be based on the author's personal experience but might draw on factual statements and opinions expressed in the "country" papers. This introductory paper should deal with:

(i) the place of fishery research in national and international fisheries development and conservation programs;

(ii) the use of fisheries administration in assisting fisheries research;

(iii) the dangers of over-administration in fisheries research; and

(iv) the problems generally encountered in financing fisheries research programs.

The Committee suggests that papers on the fisheries research administrations of the following countries, inter alia, would be useful:

Australia, Canada, Federal Republic of Germany, France, India, Israel, Ivory Coast, Japan, Norway, Poland, Peru, United Kingdom, U.S.A., U.S.S.R.

4.4 Intercalibration and Standardization of Methods and Instruments (Agenda Items 5.4, 6.5, 7.4 - ACMRR/2/Rec.8)

The Committee noted the information concerning progress made during the past years in the field of intercalibration and standardization of oceanographic (including fishery research) equipment and techniques, and commended the steps taken by UNESCO, Scientific Committee for Oceanic Research (SCOR), International Council for the Exploration of the Sea (ICES) and other bodies to set up working groups to study these problems at various levels, including those steps taken by regional commissions on fishery matters (see also Recommendation 12). The Committee reaffirms ACMRR/1/Rec.5 and requests Biology Branch to keep these important matters under review and to report to the next session.

4.5 Meetings

4.5.1 World Scientific Meetings (Agenda Item 5.5 - ACMRR/2/Rec.9)

(a) In view of the very successful Environmental Symposium recently held by ICNAF, and of the proposal (see ACMRR/2/Rec.22) that FAO should co-sponsor the Second International Oceanographic Congress, the Committee recommends that a World Meeting on the Effects of the Environment on the Abundance of Fish Populations, as proposed in ACMRR/1/Rec.7, need not be held in the near future.

(b) The Committee considered the arrangements being made for a World Meeting on the Biology and Culture of Shrimps and Prawns in the biennium 1966/67, endorsed in principle by the 12th Session of the FAO Conference. It recommends that, in view of the growing importance of fisheries for shrimps and prawns, and the interest of a large number of member countries in them, preparations should be accelerated and the Meeting held as soon as budgetary provision can be made. The Committee hopes that an offer from a member government to act as host would soon be made. Members of the Committee offered to suggest to the Secretary of the Meeting (Mr. H. Rosa) names for the Consultant Group of scientists to be invited to prepare the program.

4.5.2 Symposium on Tropho-dynamics of Marine Communities (Agenda Items 5.5, 6.2 - ACMRR/2/Rec.11)

The Committee was informed, concerning ACMRR/1/Rec.18c, that the International Council for the Exploration of the Sea had not felt able to consider, at the present time, holding a symposium on the development of dynamic models of production at the various trophic levels ("tropho-dynamics"). The Committee established a working group to review (if possible by correspondence) the possibilities for such a symposium, especially as to whether the time is ripe for it and, if so, to prepare a draft program and to report to the next session, with proposals for action.

The Committee recommends the appointment to this Working Group of Mr. R. Steele (Convener), Dr. G. Hempel, Dr. D. Cushing, Prof. M.E. Vinogradov, Dr. L.M. Dickie, Dr. J. Strickland and Dr. L.B. Slobodkin.

4.6 Development and Assistance in Stock Assessment

4.6.1 Resource Assessment and Statistics (Agenda Item 5.6 - ACMRR/2/Rec.10)

The Committee noted and commends the progress made in the development of statistics for stock assessment, and the intention of the Director-General to initiate a small stock assessment unit, even though progress had been slower than planned owing to inadequate staffing. It reiterates its view (ACMRR/1/Recs.1, 9) that this program has a high priority and is one in which FAO has a vital role, in stimulating and assisting nations and regional bodies to institute and maintain the records necessary as the basis for mangement. The Committee recommends that the staff engaged in this work be increased in order to achieve satisfactory progress.

The Committee understands that response by countries to the request made in 1963 for submission of catch statistics broken down by broad fishing regions has not been such as to permit publication of tables for 1962 catches by regions. FAO is requesting statistics for 1963 by designated regions, and areas within regions, and working to extend the standard reporting system now used for the North Atlantic to other regions. The success of this work depends on the ability and willingness of countries promptly to report the requested data, and the Committee recommends that all possible encouragement and assistance to countries in this task be provided as a matter of urgency.

4.6.2 Direct and Speedier Estimation of Fish Abundance (Agenda Items 5.6, 7.4 - ACMRR/2/Rec.12)

The Secretariat reported that the Biology Branch of Fisheries Division had unfortunately been unable to make progress in reviewing recent work in the rapidly developing field of the direct and speedier

estimation of fish abundance by the use of echo-sounders and by other methods (ACMRR/1/Rec.5). In the view of the Committee, a satisfactory solution to this problem would have the most important possibilities for unexplored areas. It is, therefore, a matter of urgency and the Committee established a Working Group to review the latest developments in this field and to report accordingly to the Committee at its next session.

It recommends the appointment to this Working Group of Mr. B.B. Parrish (Convener), Dr. D. Cushing, Mr. L.S. Midttun, and a specialist in this field to be nominated by the State Fisheries Committee of the U.S.S.R.

4.6.3 Appraisal of the Resources of Sardinella and other small Clupeoid Fishes in the Gulf of Guinea (Agenda Items 5.7, 6.1 - ACMRR/2/Rec.13)

The need for undertaking a cooperative survey of the distribution and abundance of Sardinella and other small Clupeoid fishes in the Gulf of Guinea was discussed on the basis of an outline for such a project presented by the Secretariat (Annex 8).

The Committee expressed great interest in this proposal and agreed that such a project could be of immense benefit to West African countries in providing scientific data on pelagic stocks, probably of great extent and abundance, which are a potential source of much needed animal protein.

The Committee recommends that a Working Group of specialists be convened by FAO under the auspices of the Regional Fisheries Commission for Western Africa to make a preliminary study of the project and report to the Director-General.

The Working Group might also include members from countries other than members of the Commission which are interested in the exploration of the pelagic stocks in the area, or in which techniques for direct assessment of stocks are being energetically developed. The Committee expressed the belief that exploratory projects of the kind outlined in Annex 8 would provide an important testing ground for use of new techniques of assessing marine resources and for developing new forms of international cooperation in exploration of unexploited stocks.

## 5. COORDINATION AND COOPERATION WITH OTHER BODIES

### 5.1 FAO Regional Fisheries Bodies (Agenda Item 6.1 - ACMRR/2/Rec.14)

The Committee noted the large degree to which the activities it had discussed were organized on a regional basis, and recognized the importance of the regional fisheries councils and commissions in providing machinery for international exchange and collaboration in marine resources research. The Committee considered that collaboration with, and assistance to, these bodies should afford the Division a most effective means of discharging its responsibilities.

The Committee had already noted the extremely useful collaboration between the Division and several regional fisheries commissions and councils, but had to note some inadequacy in the Division's support of such bodies established by FAO itself. The Committee considered this the more unfortunate because the membership of FAO bodies is largely of developing countries, and these bodies have been established in regions where great distances, lack of trained personnel and other deficiencies make special difficulties.

The Committee discussed the fisheries problems in the area covered by the Indo-Pacific Council (IPFC). It noted that in this area existed a large proportion of the human population suffering from protein malnutrition, inadequate arable land to provide the additional required animal protein, and an abundance of fish with which to meet this human need. It concluded that the IPFC in respect of its research responsibilities had been unable adequately to stimulate fisheries development in this region, and that a massive and sustained increase in support would be needed to remedy this serious situation.

The Committee learned, during its discussion of the IPFC report, of the very slow development of several activities in which that Council is interested. Considering the size of the Indo-Pacific area, and the importance of fish to the great human population there, the Committee expressed its concern over this situation. The Committee understood that the IPFC's program in marine resources research needed greater support from the Division in:-

(i) technical servicing of committees and working groups;

(ii) providing technical advice and aid to member countries;

(iii) accelerating the training of technical personnel;

(iv) conducting symposia and seminars; and

(v) other matters.

Some of the support described above could be provided through the Regular Program and some through technical assistance programs. The Committee believed the unsatisfactory situation of the IPFC was not unique and that indeed similar situations must exist with regard to the new commissions recently established in the South Atlantic, and noted that the servicing of these could not effectively be provided by a staff which was already inadequate to the earlier task.

The Committee considered that an important element of its advice to the Director-General with regard to improving the status of this Fisheries Division would relate to the Division's work with regional councils and commissions. The Committee therefore recommends the establishment of a Working Group to propose ways in which the work of these councils and commissions in marine resources research might be made more effective, especially through the support that FAO might give them, with particular attention to the needs of the Indo-Pacific region noted above.

At its final meeting, the Committee recommends the appointment to this Working Group of Dr. G. Kesteven (Convener), Mr. J. Adjetey, Prof. F. Gneri, Dr. C. Lucas and Dr. N. Panikkar.

5.2 Booklets on Oceanography and Meteorology for Fishermen (Agenda Item 6.3 - ACMRR/2/Rec.15)

The Committee was informed of the results of the WMO Working Group on Weather Advice for Fishing Operations and in this connection was requested by the Secretariat to consider a proposal for publication of a booklet on "Fishermen and the Weather", and another on "Oceanography for Fishermen", which could be used by national agencies as models for booklets to be distributed to fishermen.

The Committee considered that such booklets would be widely read and appreciated by fishermen everywhere, and recommends that the models be produced by FAO in collaboration with WMO and UNESCO as expeditiously as possible.

## 6. MATTERS CONCERNING THE INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (Agenda Item 7)

Dr. Fedorov introduced the subject on behalf of the Commission. He briefly pointed out the items referred to in IOC Resolutions on which specific advice from the Committee was requested. He also mentioned the need for comments on two basic questions:- (a) how cooperative oceanographic activities of the IOC could become useful for fisheries research; (b) how fisheries research could contribute best towards the increase of scientific knowledge about the ocean, and some other general problems closely related to the GSF which are still very far from being answered.

Dr. Fedorov stressed the need for more specific recommendations on the fishery aspects of oceanographic projects and suggested, as a way to improve the correct formulation of such projects, the direct participation of fishery scientists in the planning stage of oceanographic expeditions on both national and international levels. He also emphasized the need for fishery scientists to become more familiar with the tremendous progress made during past years in all the fields of non-applied oceanography, particularly as a result of theoretical studies. He insisted on the advantage of conducting fisheries research in the context of all the other marine biological problems. The IOC would appreciate receiving ACMRR's advice on research programs on energy transfers in the oceans, not only with regard to one link (fish) of this complex chain of processes, but also with regard to all others and their inter-relations. Dr. Fedorov expressed the hope that at the Second World Oceanographic Congress the topic "Ocean Resources for the Benefit of Mankind" would be planned bearing in mind this broad approach.

After a general debate, discussions concentrated on specific items according to the Agenda.

### 6.1 General Matters Concerning the Intergovernmental Oceanographic Commission - IOC (Agenda Item 7 - ACMRR/2/Rec.16)

In its capacity as advisory body on the fisheries aspects of oceanography to the IOC, the Committee received a statement from the Secretary of the Commission on the general questions concerning which that body is seeking advice. The principal questions are: how can oceanographic programs sponsored by the Commission contribute to the solution of fisheries problems, and how can the work of fisheries research agencies assist in the solution of oceanographic problems generally? The Committee discussed at some length the relations between oceanographic work carried out primarily for fisheries purposes and that having more general objectives. The importance of close collaboration was stressed and it was pointed out that oceanographic work of great fundamental importance has been, and is being, carried out by fisheries agencies, whilst a high proportion of that by other agencies is of value to fisheries research.

The Committee strongly recommends that the fisheries interests be adequately represented in the planning of international oceanographic projects sponsored by the IOC and, in particular, that close collaboration continues between the IOC, the Fisheries Divisions of FAO, WMO and regional fisheries bodies, so that the best use can be made of all international projects both for fundamental research and for the solution of practical fisheries problems.

Without limiting its interest to these fields, the Committee stresses the importance to fisheries of information on: (i) the depth of the mixed layer and its variations (including those caused by seasonal and long-term changes and internal waves, among other factors), (ii) currents and their variations in position and intensity, (iii) boundaries of water masses, (iv) upwelling and (v) the effects of all these on water properties. Such information

contributes to an understanding of where and when commercially valuable concentrations of fish become available. The Committee stresses the importance of prediction of changes in oceanographic conditions in areas of actual or potential fisheries, notes the attempts at prediction now being made and recognizes that progress depends on oceanographic projects being planned on a broad basis, both geographically and as regards scientific disciplines.

The Committee recognizes also the ultimate great importance to fisheries development of the measurement of biological production and its variations in time and place. It believes, however, that the main emphasis must still be placed on fundamental research to discover the mechanisms of biological production.

6.2 General Scientific Framework for World Ocean Study - GSF (Agenda Items 6.4, 6.5, 7.1 - ACMRR/2/Rec.17)

The Committee discussed the report of its Working Group on the Fisheries Aspects of the General Scientific Framework for World Ocean Study (Part II of this report) which also included a statement on the International Biological Program (IBP) of ICSU, as it promises to develop, in relation to the General Scientific Framework.

The Committee recommends:-

(i) that copies of this report be transmitted to the Intergovernmental Oceanographic Commission (IOC) and to the Scientific Committee for Oceanic Research (SCOR) in response to their requests for the Committee's views on these subjects;

(ii) that the Chairman of the Working Group (Dr. D.H. Cushing) be requested to attend the next meetings of the SCOR Working Group on the GSF and of IOC, at the Organization's expense, in order to present the Committee's views; and

(iii) that copies of the report also be sent to the Special Committee for the IBP for its information, and with appreciation of the assistance of Mr. R.S. Glover in keeping the Secretariat and the ACMRR Working Group informed of progress.

6.3 Rapid Utilization of Synoptic Oceanographic Data and Fixed Oceanographic Stations (Agenda Items 7.2, 7.3, 7.5 - ACMRR/2/Rec.18)

The report of the Working Group on this subject was considered. Sections 1 (General) and 2 (concerning the installation and protection of fixed oceanographic stations) were adopted, with small amendments (Part III of this report). With regard to Section 2 of the report, the Committee was pleased to learn from the Secretary of IOC that a list is being compiled of the fixed oceanographic stations.

The Committee recommends that these Sections as amended be transmitted to the Intergovernmental Oceanographic Commission in answer to its requests for advice from the Committee on these subjects.

It further recommends that the reports be transmitted to IMCO, drawing the attention of that Agency to Section 2, and that a member of the Biology Branch be designated to work with the IOC Working Group on Fixed Oceanographic Stations.

Section 3 of the Working Group's report, concerning Biological Data Exchange, was noted and discussed at some length. Special attention was paid to the different requirements for various kinds of marine biological data, (from the

general collection of marine samples through data concerning primary production to utilizable marine resources), and the proposals to deal with them which have been made by several bodies.

The Committee recommends:

(i) that the Secretariat should examine the present state of the developing techniques of reporting on the distribution and abundance of marine resources, and also the feasibility of the proposal that FAO might serve as a specialized centre for the exchange of such data, and report to the Committee; and

(ii) the establishment of a Working Group to collaborate in respect of the general problems of Biological Data Exchange with a counterpart group from SCOR, if SCOR should establish such a group. It recommends that this Working Group be composed of Dr. G. Hempel and a member of the Secretariat.

6.4 Cooperative Investigations

6.4.1 International Cooperative Investigations of the Tropical Atlantic - ICITA - and the Guinean Trawling Survey - GTS (Agenda Items 6.2, 7.6 - ACMRR/2/Rec.19)

The ICITA and the GTS are complementary efforts, the first being concerned with the tropical environment of the Atlantic in relation to pelagic fisheries and the second with the continental shelf environment of West Africa and the stocks of trawlable demersal fishes thereon. Considering the usefulness of these two expeditions as a basis for the further development of the fisheries of the Tropical Atlantic, the Committee recommends to IOC that their results be published together or, where this is not practical, in similar form, including both data reports and an atlas or atlases.

Further to enhance the contribution for fisheries development from these expeditions, the Committee also recommends to FAO and IOC that FAO, in cooperation with UNESCO and CCTA sponsors a symposium on the results of the ICITA and GTS and their implications for fisheries.

The Committee further recommends that FAO and IOC explore the possibilities of financial support for the publication of atlases presenting the results of these expeditions.

The Committee appointed Mr. J.N. Adjetey as Special Rapporteur on ICITA and GTS and requested him, in consultation with the International Coordinator for the ICITA, Mr. T. Austin, and the Director of the GTS, Mr. F. Williams, to report on the results of the two expeditions to the next session of the Committee.

6.4.2 South Atlantic Cooperative Investigations - SACI (Agenda Items 6.1, 7.6 - ACMRR/2/Rec.20)

The Committee expressed its appreciation of the report by its Special Rapporteur on the South Atlantic Cooperative Investigations being carried out by Argentina, Brazil and Uruguay, and commended the progress made so far. The Committee accepted the report and recommends that it be transmitted to the Intergovernmental Oceanographic Commission for consideration at the Commission's forthcoming Session.

The Committee appointed Prof. F. Gneri as Special Rapporteur and asked him to report to the next session on progress made during the year.

6.4.3 Cooperative Study of the Kuroshio - CSK (Agenda Item 7.6 - ACMRR/2/Rec.21)

The Committee noted that fisheries interest in this project had been well presented by the presence of Prof. M. Uda, Special Rapporteur for the ACMRR, Mr. A. Tubb representing FAO, and Mr. J. Marr representing the Indo-Pacific Fisheries Council, at the meeting of Marine Science Experts on the Kuroshio Region convened in Tokyo in October 1963, and that this was reflected in the report of that meeting.

While it had been possible to list in some detail the requirements for physical oceanographic observations, the sampling of plankton and the measurements of primary production, much further detail was needed regarding the observations on fish (including eggs and larvae) and benthos. In view of the fact that these Investigations are scheduled to start in 1965, there is an urgent need to convene a meeting of representatives of participating countries to develop this part of the plan. The Committee recommends that the need for such a meeting, in sufficient time for a report to be transmitted to the 3rd Session of the Intergovernmental Oceanographic Commission in June, 1964, be brought to the attention of the governments concerned.

Recognizing that the technical facilities available to some of the more needy countries proposing to participate in the surveys may be inadequate, the Committee further recommends that FAO join UNESCO in trying to resolve these needs, either by establishing a "pool" of equipment or by any other appropriate means.

6.5 Second International Oceanographic Congress (Agenda Items 5.5, 6.3, 7.7 - ACMRR/2/Rec.22)

There was considerable discussion about active participation by FAO in the Second International Oceanographic Congress, on the theme "Resources of the Ocean. Ocean Research for the Benefit of Mankind", which will be held in Moscow in the Spring of 1966. The concensus was that it was important that problems in fisheries science be adequately presented in that Congress and that a symposium on such problems should be included at an appropriate time on the agenda.

The Committee recommends to FAO and to IOC that there be joint sponsorship by FAO and UNESCO of the Second Oceanographic Congress. It also recommends that a symposium on the oceanographic aspects of fisheries science be included as part of the program and that both technical and financial support of the Congress be provided by FAO.

The Committee further recommends that this proposal replace that for an Environmental Symposium contained in ACMRR/1/Rec.7.

7. DATE AND PLACE OF THIRD SESSION (Agenda Item 10 - ACMRR/2/Rec.23)

The Committee recommends that its next session be held during the first half of 1965, the exact date being determined by the Secretariat in consultation with the Chairman and Vice-Chairmen, bearing in mind the need for suitable timing in relation to advice on the program of FAO and to the date of the 4th Session of IOC.

The Session will be held at FAO Headquarters.

8. OTHER BUSINESS

8.1 Organization and Establishment of Working Groups (Agenda Item 12 - ACMRR/2/Rec.24)

The Committee recommends that the working groups mentioned in its Recommendations be convened and serviced by appropriate staff of FAO Fisheries Division. Insofar as the work of groups can satisfactorily be done by correspondence, it should be so done.

If persons proposed by the Committee for membership of working groups are not available suitable alternates should be nominated by the Secretariat in consultation with the Chairman and Vice-Chairmen.

9. ADJOURNMENT (Agenda Item 13)

The Chairman, on behalf of Members of the Committee, expressed to the Director-General of FAO his appreciation of the meeting and of the facilities offered for it by FAO, and the secretariat services provided.

The Session was then adjourned.

## II REPORT ON FISHERIES ASPECTS OF THE GENERAL SCIENTIFIC FRAMEWORK FOR WORLD OCEAN STUDY*

| | | |
|---|---|---|
| Present: | D.H. Cushing | Convener |
| | S.J. Holt, N.K. Panikkar, H. Rotschi | Members of Working Group |
| | F. Gneri, G.L. Kesteven, C.E. Lucas | Members of ACMRR |
| | F.W.G. Baker, R.S. Glover | Representatives of IBP |
| | K. Fedorov | Office of Oceanography, UNESCO |
| | M. Ruivo | Secretary, ACMRR |

There are a number of biological problems, of great interest to fisheries workers, that are not treated here either because they have no significance in an oceanographic context (for example, taxonomy) or because they are part of a discipline independent of oceanographic research (for example, algal physiology). Fish behaviour, fish physiology, primary productivity, plankton physiology are all disciplines valuable to fisheries biologists, but also practised outside fisheries laboratories.

There are physical problems in oceanography, not merely of interest to fisheries biologists, but fundamental to their work. They include the study of physical processes which obviously will affect the distribution and abundance of fishes in the long run. An important problem is the understanding of the atmospheric and oceanic circulation and the prediction of the processes underlying them. Other topics of interest are the penetration and distribution of light in the sea, the charting of certain physical and chemical properties in the ocean as anomalies (for example, temperature, currents, oxygen deficiency, turbidity, and drastic changes of salinity), the formation, persistence and structure of eddies, propagation of internal waves, etc. However, of particular and direct importance to the fisheries biologist are studies of diffusion and advection. Each problem is of direct value to the fisheries biologist but he can play little part in their solution, save applaud the attempt.

### 1. FISHERIES ASPECTS OF THE GENERAL SCIENTIFIC FRAMEWORK FOR WORLD OCEAN STUDY

Fisheries science is concerned inter alia with the distribution and abundance of useful living resources in relation to marine processes.

The discovery of new resources, development of culture and transplantation methods, underwater farming methods, breeding methods, artificial upwelling zones, the use of fertilizers and poisons, thermonuclear heating of large bodies of water, the evaluation of the world biological resources of the ocean, the echo study of fish distribution: these are all facets of the same problem, how to procure more fish.

It is convenient to consider the problems in fisheries science in two groups. The first is the distribution and availability of stocks and the second is that group of population processes vulnerable to oceanic processes.

---

* This is the Report of the ACMRR Working Group on Fisheries Aspects of the GSF for World Ocean Study, as amended and adopted by the Second Session of the ACMRR.

## 1.1 Distribution and Availability of Stocks

The distribution of a stock may extend over a much wider area than that in which it can be fished. Where the fish are caught is where they are available to capture by a specified gear. Limits to distributional range may be physical or biological. In the assessment of availability there is an important technical point. Catch per effort or density is related to abundance, or total numbers by a proportionality coefficient, $q$, the catchability coefficient. Variations in accessibility are estimated as deviations from $q$ and it is these that should be related to the physical anomalies. Tanaka (1960) has published clear relations between the density of salmon and its escapement from the rivers. Hence physical expertise must be accompanied by biological expertise.

In more general terms we examine the problem of availability.

Two groupings are possible, exemplified by the tuna in the Pacific and the menhaden and sardine in the Atlantic. In both are found great variations in catch and catch per effort which are not related to the effects of fishing and possibly not to year class variation. The fact that in both groups there are temperature dependences suggests that the stocks are drifting or migrating in the oceanic currents. This is of course what Uda showed so clearly for the bluefin tuna in its approach to Japanese waters.

An attempt to formulate the processes in physical terms has been made by Seckel in an "Oceanographic Investigation of the Trade Wind Zone of the Central North Pacific". It is thought that variations in stock of tuna in the Central Pacific are relatable to the dilatation and contraction of the North Pacific equatorial system. The method used is to estimate the heat budget over rather a wide area of the ocean. The whole problem is reduced to a well organized and properly led project. But the important point is that it illuminates many other pieces of work. In summer the Norwegian herring aggregate at temperature boundaries, the gradient of which is far too low for the fish to detect. Hence the fish are perhaps being mechanically concentrated in the sense that the tuna appear to be mechanically concentrated in the central Pacific at certain seasons. Herring in the Norwegian Sea, cod in the Barents Sea, cod on the Dohrn Bank and menhaden in the western Atlantic all show distributions limited to isotherms. The solution to such problems may not always be that put forward by Seckel, but it is obvious that physical studies are needed - if only in a network of current meters.

There are other aggregations associated with spawning and feeding, in addition to some specifically physically caused aggregations. What are the preferences of some molluscs for certain substrata? Why do fish pick out certain restricted spots for spawning? This is a combination of information on water movements of a quite detailed character with some link in the fish's sensory channels which enables it to recognize a spawning ground when it appears. Here again is the connection between rigorously made laboratory experiments and common physical information. The physical information may be complex in itself, but comparatively easy to obtain, in some instances.

A second form of aggregation is that concerned with feeding. Given the right formulation, in model terms, of the aggregative processes, this is really an extension of the study of productive cycles. For pelagic fish we need the growth rates and reproductive rates of the commoner zooplankton organisms, in addition to estimates of density and abundance in the sea. Yet again, there is a need not only for work at sea, on a variety of scales, but also for experimental work ashore together with the detailed and laborious work on life histories.

Some changes in the availability of fish stocks are so dramatic that they may be described as oceanic events. Classed here are the direct effects of the ocean on fisheries in the plain manner. The most striking is the effect of El Niño on the anchoveta fisheries off Peru. Is the stock displaced by the warm current? What proportion of the stock is killed by the warm current? Not only is the physical description of El Niño needed, but also its origin. Presumably with considerable physical research in the Eastern Pacific Equatorial region, the origin of El Niño will become understood. This will be of great value to the Anchoveta fishermen even if it only means that what is predicted is that once in nine years they fish further offshore. If a proportion of the stock is killed by El Niño, the sooner that proportion is known the better. So not only is a physical problem of extensive scale envisaged, but much work is needed within the study of the fishery itself, in terms of stocks and the proportion killed by the warm current, if any.

Another oceanic event, upwelling, is a widespread one and in this context will include divergences, dome effects and island effects. The anchoveta fishery off Peru, the Benguela complex of fisheries, the tuna fisheries along the Line, are all examples of this phenomena. There is an element of simplicity about an upwelling area which is deceptive, i.e. nutrients reach the surface and cause a fishery. The physical description of events is laborious, but perhaps not too difficult. The biological description is difficult. There are two reasons for this. Firstly, in order to associate the fishery with the high production, the whole productive cycle must be broken down, showing how each trophic level depends upon that below. Secondly, it is rather mysterious how a fish stock should remain at the "point of upwelling" (if it does) in a state of high abundance from generation to generation. Here the mechanisms of recruitment from a given stock may be obscure in the terms of more temperate fisheries. The same principles apply to divergences, dome effects and island effects, but these may be temporary ones.

Summarizing, there are a number of fish stocks which become more or less available when oceanographic conditions change, for example, various tuna species, Atlantic menhaden, European sardines, and Atlantic redfish. In addition, there are stocks subject to dramatic ocean changes, chiefly associated with the upwelling areas and the equatorial complexes, for example, the Peruvian anchoveta, the Benguela sardine and the Equatorial tuna.

## 1.2 Population Problems

The problems of population analysis that might be affected by oceanographic events are those of migration, the description of unit stocks, recruitment, growth and mortality.

### 1.2.1 Migration

Problems of salmon, tuna, herring or cod migration are large problems in themselves. Here we are concerned with a more general outlook. What are the links between biochemical factors and various behaviour patterns in the sea? How does one study fish physiology in relation to hydrographic conditions relevant to migration? Professor Uda has suggested a kinematic study of migration. Obviously this can only be achieved by extensive study of catch/effort statistics, echo survey material and large quantities of current measurements; perhaps some forms of exploratory fishing should be linked in here, together with the airborne recording of pelagic fish shoals. The latter is most attractive because it can be linked with the use of the infra-red radiation meter.

Here are combined large scale oceanic surveys and the spread of a network of current meters with exact laboratory work and work in the seas or oceans on a comparatively restricted scale. For example in the North Atlantic might be set up an array of current meters covering the West Spitzbergen Current, the North Cape Current, the Irminger Current, the East Greenland Current, the Faroe-Shetland Channel, etc., etc. The laboratory work associated with the array of current meters would include the analysis of behaviour in terms of the sensory channels used, the endocrine control of activity and the more complex forms of behaviour mechanism employed by the fish.

1.2.2 The Description of Unit Stocks

In this problem we may be concerned with the temporal changes in the nature of water masses and their circulation. How do demersal stocks maintain themselves on oceanic banks? What are the stock relations of the ocean cod and of the redfish? One might imagine that the substocks of the Californian sardine mix and segregate within the changes of the California current regimes. The fisheries biologist has few weapons in this field, hence his interest in parasitology, immunology and the statistical separation of subpopulations. It is possible that fish populations migrating in the direction of the oceanic drift might lose sections to the deep ocean or to other coasts. Obviously a proper measure of the oceanic drift at frequent intervals could help solve this sort of problem. By the nature of things this problem becomes more important and more complex amongst the numerous pelagic species in tropical waters.

Many stocks are subject to dramatic changes in year class strength, as for example, Norwegian herring, Hokkaido herring, Californian sardine.

1.2.3 Survival of Eggs and Larvae

There are two components of loss of larvae:-

(a) mortality due to physical and biological causes;

(b) loss by diffusion and advection.

Which losses or mortalities or combination of them govern the strength of a particular year class?

What proportion of total loss is the physical loss?

In any upward or downward trend in recruitment, there is presumably a change in the proportionate losses. In the case of the Californian sardine, it is possible that the stock was reduced to the point at which a competitor (the anchovy) took permanent advantage. Thus the mechanisms of competition must be analysed; these may be complex mechanisms dependent on food supply and the relative number of competitors or they may be simple mechanisms dependent on different hatching temperatures and the relative initial numbers of competitors. The problem of larval mortality is complex, needing much skilful and extensive work. Norwestlant is a reconnaissance of this problem. The major scientific difficulty is the proper separation of the forms of loss and mortality. The main administrative problem is the large number of ships required to mount even the reconnaissance surveys.

1.2.4 Growth

Changes in fish growth must be modulated by long term trends in temperature to some extent. Recent changes in the growth of herring in the North Sea are associated with changes in the numbers of their preferred food, Calanus. It is possible that additions to the winter populations of Calanus from outside the North Sea are ultimately responsible for those changes; it is rather difficult to unravel the parts of the oceanographic complex responsible.

1.2.5 Mortality

It is likely that the common mortality of fish is not affected at all by oceanographic changes. However, the ICNAF Environmental Symposium has documented mortalities due probably to cold water. Mass mortalities can be attributed to hydrogen sulphide, perhaps to oxygen lack and to the red tides. The physical causes of the latter are unknown.

## 1.3 Conclusion

There are two sorts of problem relevant to the General Scientific Framework:

(a) Those which need physical research, for example, the processes of larval survival and those of oceanic availability, as for example in upwelling areas.

(b) Those which need physical measurements, for example, current measurements in the analysis of migration and the establishment of unit stocks. Much of the study of fish behaviour is dependent upon good physical measurements.

This classification of problems is one in which the involvement of physical science is the criterion. It determines the relevance of the problem to oceanographic study.

It emphasizes the importance of the joint organization of specific projects between physicists and fisheries biologists.

## 1.4 A Preliminary List of Projects

There appear to be two sorts of projects, that which is quite general in scope and that which is quite specific. The general projects are of two sorts. Firstly there are the broad physical problems, for example, the dynamics of the North Atlantic Ocean. This is a physical problem which might be suggested or commended by fisheries biologists, but planned, executed and analyzed by physicists. The second type of general project is that yielding basic information in time series, such as current meters from lightships or arrays of unmanned and telemetering buoys. Lastly there are some executive arrangements that follow in the wake of international projects. The important question of whether a project is of a regional or supra-regional character comes last because only when formulated as a project can it be seen what size it is.

### 1.4.1 Specific Projects

Some possible projects are listed below, but at this stage it is not possible to go into further details.

(a) Recruitment

Californian sardine;
Hokkaido sardine;
Hokkaido herring;
Norwegian herring;
Peruvian anchoveta;
Greenland cod (as studied in Norwestlant);
South African pilchard
Norwegian cod (Lofoten).

This is an incomplete list, set out briefly. When it is considered that Norwestlant was probably no more than a reconnaissance, each problem becomes a project of considerable scope.

(b) Availability in the oceans

Bluefin tuna off Japan;
Albacore off Japan and California;
Yellowfin in Central Pacific;
Menhaden off Eastern Seaboard;
Norwegian herring off Iceland and Jan Mayen;
Tuna in Central Atlantic;
Anchoveta off Peru;
Malabar oil sardine;
The Benguela complex of fisheries;
The Californian sardine;
The equatorial complex of fisheries;
The Indian continental shelves.

There is an additional point here. The IIOE can be used as an oceanographic reconnaissance, with particular problems and projects emerging connected with the Indian fisheries, the fisheries of Malaysia and Indonesia and the East African fisheries. Particular problems here are the Malabar oil sardine, equatorial tuna, upwelling areas and monsoon areas.

(c) Migration

The prime need is for continuous measurement of currents from arrays of unmanned buoys placed at strategic positions. The world might be split in zones, N.E. and N.W. Pacific, N.E. and N.W. Atlantic, etc. In the north-east Atlantic an array might be set up covering the West Spitzbergen Current, the North Cape Current, the Irminger Current, the East Greenland Current, the Faroe-Shetland Channel, etc. The same array is of course useful for many other purposes.

(d) Productive cycles

In order to study aggregations and the biological conditions in the sea, study of productive cycles affecting zooplankton is needed in different regions of the ocean.

1.4.2 General Projects

(a) Charting the Ocean

Surface temperature charts and surface salinity charts.
Charts of depth of the mixed layer.
Bathymetric charts.
Distribution of nutrients, plankton and "sonar biomass".

(b) Exploration

Distribution of fish eggs and larvae.
Distribution of fish populations, with catching gear and with echosounders.

(c) General biological projects

The study of fish behaviour.
Taxonomy of fish and plankton.
The study of production.
The studies of predation and competition.

(d) General physical projects

The study of diffusion.
Dynamic studies of unit areas of the oceans, such as the North Atlantic, the Central Atlantic, the South Atlantic.

The general projects include work carried out by physicists and biologists with no connection with fisheries. Much of this work is of eventual direct use to fisheries, which the fisheries biologists would now commend.

1.4.3 Executive Arrangements

(a) Intercalibration and standardization.

(b) Rapid data collection and common storage.

(c) Nomination of project leaders.

## 2. THE INTERNATIONAL BIOLOGICAL PROGRAM AND THE GSF

### 2.1 Special Committee on IBP

The Committee noted that the International Council of Scientific Unions had set up a Special Committee to execute an International Biological Program entitled "The Biological Basis of Productivity and Human Welfare".

### 2.2 Organizational Framework for the IBP

The Working Group was not given detailed information on the contemplated organizational framework for the IBP, but it appeared to the Committee that there could realistically be only two possible forms: IBP might be an organization to coordinate those activities which at present do not stand within any existing framework of coordination, or it might be an arrangement for coordination, in certain aspects, of this kind of work by all types of institutions.

The IBP has a special value for the independent institutions which are not directly involved in fisheries research and do not participate in existing international organizations.

### 2.3 Other Related Matters

On the basis of discussions held on other matters concerning IBP, the Committee approved the following points:

(a) It is urged that every effort be made to include the benthos in the program and it is recognized that this would involve preliminary work on apparatus and methods; if necessary, the IBP should initiate such preliminary sampling studies which would be important in a wider context than the immediate one of IBP.

(b) It is recommended that IBP studies of resources (as in Section (i), p. 13 of IP 15) should not be restricted to fish, but should consider the third trophic level as a whole. It is further recommended that the aspect of those resources which should receive special attention is their part in the trophic network in the sea.

(c) In general, however, it is hoped that problems of apparatus, standardization and intercalibration will be referred to the various international working groups which have been set up to deal with such topics.

(d) The importance of consultation with existing international and national organizations is again emphasized, in order to avoid duplication of effort. In particular, there should be close association with the GSF proposed by IOC.

## III REPORT ON THE RAPID UTILIZATION OF SYNOPTIC OCEANOGRAPHIC DATA, FIXED OCEANOGRAPHIC STATIONS AND BIOLOGICAL DATA EXCHANGE*

Present: V.E. Brock — Convener

M. Blackburn, J. Eggvin, M. Uda — Members of Working Group

The discussions on Biological Data Exchange were also attended by members of the ACMRR, representatives of UNESCO, SCOR and IBP and by the staff concerned in FAO Fisheries Division.

### 1. RAPID UTILIZATION OF SYNOPTIC OCEANOGRAPHIC DATA

The Intergovernmental Oceanographic Commission requested of the ACMRR advice and comments on the subject of the rapid utilization of oceanographic data and fixed oceanographic stations. The mission of the ACMRR as it relates to the more efficient use of fishery resources involves the rapid utilization of synoptic oceanographic data and fixed oceanographic stations among other things. Obviously, also of concern are the problems of data exchange.

The use of oceanographic data for fisheries falls into three possible developmental stages. The initial stage is the exploration and survey of the distributions of oceanographic variables for a region. To a degree the oceanographic work currently under way in the Indian Ocean and the tropical Atlantic Ocean is of this sort. When a sufficient number of observations have been obtained over an adequate period of time, average distributional patterns and their ranges can be depicted, including the seasonal cycle. At this level of oceanographic understanding, the compilation of synopses and atlases becomes useful. These are currently being produced for several regions. The third stage is attained when it becomes possible to do more than a static description; the anomalous conditions that occur are monitored and periodically described, and attempts are made to predict changes in the ocean climate and the effects of these on fisheries. These can be based on empirical criteria or on understanding through research. Obviously the latter is much the stronger approach.

Due to the variety of sources of oceanographic observations and the ways of obtaining them, various kinds of oceanographic observations fall into various of these stages, especially the second and the third. For the third stage, the frequency of observations and their degree of synopticity should be adequate to describe changes in the observed property essentially as these occur for a given region.

Fishermen are concerned more with the unexpected changes that may occur in the availability of fish: the average seasonal situation is ordinarily one to which they have become accustomed. The departures from the normal situation are the sources of unexpected economic hardships or windfalls, and it is the prediction of these, or even the appreciation that an anomalous oceanographic event is with us, that is of greatest value. Unexpected changes in yields from a fishery by reason of environmental changes are, of course, of greater importance for some fisheries than for others. The pelagic fisheries are most strongly affected since the species concerned are the most mobile. However, demersal fishes also respond to anomalous oceanic conditions, their movements in response to such conditions

---

*This is the Report of the ACMRR Working Group on Rapid Utilization of Synoptic Oceanographic Data and Fixed Oceanographic Stations, as amended and adopted by the Second Session of the ACMRR.

being limited perhaps by the extent of suitable bottom habitat. The reproductive success of fishes is also strongly affected by anomalous oceanic conditions and these may result in fluctuations in the number of recruits entering a fishery with important consequences on the subsequent yields from the fishery. It is to this situation that fisheries oceanography in the third stage can contribute effectively. It is of importance to begin operating at this level to the extent now possible, initially perhaps using only a few environmental parameters. This is the thesis of this working paper.

In addition to the potential value for the fisheries of synoptic maps of ocean climate, these should be useful to others concerned with the oceans. Ocean climate affects and is affected by the atmosphere, hence meteorologists should find such maps of interest. The charts may be of use to merchant mariners in some situations, and to navies in many situations.

Chapman in his statement (Research respecting resources in the general scientific framework for a comprehensive program for world ocean study) to the April 1963 meeting of SCOR in Halifax discussed in detail the kinds of environmental data desirable for fisheries research and fisheries. He also provided suggestions concerning the implementation of the required programs of data collection, reduction and analyses.

Blackburn (1963, Transactions of American Geophysical Union) in his resumé of the work of the Eastern Pacific Oceanic Conference Committee on Unmanned Instrument Stations lists the kinds of observations various segments of the scientific community feel they require, discusses present capabilities and unsolved problems, and provides some information on the specific requirements for the Eastern Pacific.

Fedorov (NS/IOC/INF-44, 24 July 1963) provides a review of the current status of the development of fixed oceanographic stations. His review is doubtless reasonably complete up to the date of the document; considering the rapidity of developments in this field, it will probably require early revision.

As yet unmanned fixed oceanographic stations are not reliable enough or versatile enough to satisfy the requirements of fishery oceanographers; their general employment must wait for future improvements in many respects. This situation is changing and it may be anticipated that instrumented buoys useful for these requirements will be developed.

The use of research and survey vessels to periodically occupy fixed stations, such as for the California Cooperative Oceanic Fisheries Investigations (CalCOFI), can, at substantial cost, provide excellent coverage of an area for a wide variety of observations. However, for the detection of short-term events, the frequency of the observations may need to be higher than is practical to provide, and the size of the region that is practical to cover is also limited. Of course, the CalCOFI type of periodic oceanographic observations for a region is not common. In addition oceanographic research and survey vessels take observations at station positions selected because of current program requirements. Oceanographic observations are made from some weather station ships. There are a few shore stations from which limited oceanographic observations are taken and a few island stations have been established for, in some instances, only limited periods of time. Potentially both aircraft and satellites can provide sea surface temperature estimates through infra-red radiation measurements, and for the latter, cloud cover measurements on a world wide scale.

The sea surface temperature observations from voluntary weather reporting ships are the most abundant observations of any oceanographic parameter, and therefore afford the best source of data for synoptic purposes that is rapidly available. However, these observations are most abundant along shipping lanes and scant elsewhere, leaving large areas, especially in the southern hemisphere with a low density of observations.

Considering the observations that can be taken now and those that may be obtained in the future, an estimate of the kinds and numbers of observations and observation stations required for various fisheries, primarily on a regional basis, needs to be developed. These estimates should also be in terms of the observational facilities required as that provided by the EPOC Committee on Unmanned Instrument Stations for the instrumented buoys needed in the Eastern Pacific for example. They should cover, however, all the observational facilities needed, not buoys alone.

These estimates would need to be made by competent persons familiar with the oceanographic and fisheries situations for each reasonable sub-division of the world ocean. The initial estimates should include both the minimum requirements and those considered adequate. They should include estimates of the division of effort among various observational facilities.

These proposed estimates would provide, when integrated, an estimate of the general effort needed for the monitoring of the marine environment as required for fisheries. This is a necessary first step in any plan leading to the satisfaction of these requirements.

For some fisheries and/or regions these estimates may be most difficult to make; more in the way of both oceanographic and fisheries investigations may be needed. This would not prevent making an estimate, but would result in an estimate of poor reliability.

There are arguments for doing this task, even if parts are done region by region, on the basis of the world ocean. Uda (1962) discussed the broad scale relation of anomalies in ocean climate for the Pacific and Atlantic Oceans, the linkage provided by deep water circulation, meteorological and sunspot phenomena, and the effects of these on certain fisheries. The evidence presented indicates the need for studies of ocean climate to be at least on the scale of a major ocean basin and preferably on that of the world ocean if long range predictions are an objective and if the whole system is to be comprehended.

There are in existence now a number of regional synoptic programs of various kinds. In Japan, synoptic maps of sea surface temperature and, in some cases, other ocean properties, are issued at short intervals (e.g. 10 days) by seven institutions, including regional fisheries laboratories, on behalf of different fisheries. Two examples follow. In the East China Sea, a trawling area, surface temperatures are reported by radio from fishing and merchant ships, in the order of about 2,000 observations per 10-day period. The Nagasaki Marine Observatory uses these data to prepare a contour chart to which the Seikei Regional Fisheries Research Laboratory and the Nagasaki Prefectural Experimental Station may attach an interpretation or a forecast pertaining to the fishery. The chart is then issued to fishermen both in newspapers and by radio; in the latter case it may be broadcast in coded information from which the chart can be reproduced. The fishermen may interpret the chart in their own way, of course. Some observing vessels measure and report surface salinity and bottom temperature as well, and charts of these properties are made and issued at regular intervals. The program has been going since 1948. Another program is operated by the Tokai University Marine Laboratory, which broadcasts 10-day surface temperature charts in code for the South Pacific and Indian Oceans. These charts may incorporate interpretations and forecasts. The charts are based on observations reported daily by the tuna boats, of which there are about 100 in each ocean, so that about 1,000 observations are available for drawing each 10-day chart. The fishermen interpret the charts in the light of their own experience. This program has been in existence since 1956.

Similarly, the United States Bureau of Commercial Fisheries Laboratory at San Diego, California, issues a chart of mean sea surface temperature for each month in the Eastern Pacific, based on information reported by radio from merchant ships (mostly) and other vessels including fishing vessels. During the albacore season, a 15-day

supplemental chart is issued for the fishing region. These charts are sent by mail to those fishermen and scientists requesting them. The United States Bureau of Sport Fisheries and Wildlife, in cooperation with the U.S. Coast Guard, is producing sea surface temperature charts for both the Atlantic and Pacific coasts, based on infra-red radiation measurements from an aircraft. They are issued monthly, but these charts refer to the time of the flight and do not necessarily represent monthly mean conditions. Mention has been made of the CalCOFI program in the Eastern North Pacific; it produces charts of surface temperature, surface salinity, and surface current for each of its frequent repetitive cruises, but these are circulated mainly to scientists for research purposes.

The Pacific Oceanographic Group of the Fisheries Research Board of Canada at Nanaimo, British Columbia, publishes weekly charts of surface temperature, potential mixed layer depth, and thickness and depth of bottom of the seasonal thermocline. This group is also working with airborne radiation thermometers and is monitoring oceanographic conditions (structure, transport, and productivity) between the coast and Ocean Weather Station P (50°N, 145°W). Here again, the information is probably of more interest at present to scientists than to fishermen.

In the western north Atlantic, the U.S. Navy made about 10 to 12 flights a month during 1963 to obtain sea surface temperatures with an airborne radiation thermometer. These data together with surface temperature data and bathythermograph traces from the U.S. Navy and other ships made possible the frequent broadcast of facsimile charts of sea surface termperature and mixed layer depth. Future plans include the use of air-dropped bathythermographs, a sea and swell recorder, and meteorological sensors, as well as airborne radiation measurements of sea surface temperature.

In waters around north-western Europe the marine scientists of the different nations have at their disposal a variety of sources of synoptic oceanographic data, namely: research ships, weather ships, light ships, merchant ships (for sea surface temperatures), and fixed oceanographic stations. These scientists combine from time to time to make intensive studies of fishery-oceanographic situation (e.g., relating to the approach of herring to the Norwegian coast) and then they utilize the above-mentioned sources of data, both in improving their understanding of the phenomena studied, and in making experimental forecasts. They also utilize their long experience of oceanographic and fishery conditions to make forecasts directly for the fishing industry, from time to time. An example of these forecasts are those made on an oceanographical basis by Norwegian scientists about availability of cod each winter in the Lofoten and Finmark fisheries. Another example concerns the cold conditions of early 1963, when the advent of unusually cold conditions was foretold from oceanographic observations and ice charts, and it was predicted that these conditions would affect different European fisheries in different ways - some advantageously and some not. These predictions were based partly on the resemblance of the temperature conditions to those of a previous cold year. An oceanographic prediction was also made that the bottom water would be renewed and remain there for some months in the deepest parts of the area. Only some of the fishery predictions were conveyed to the fishing industry, and those mainly through newspapers. A chart of mean sea surface temperature is prepared each month by the WMO station in England for the north-east Atlantic region.

In the Pacific waters of South America where the warming phenomenon known as El Niño is not only of great scientific interest (and has stimulated the making of a very sophisticated meteorological oceanographic model, which awaits further testing), but also a cause of disaster in certain fisheries, facilities for synoptic monitoring are still inadequate, although some have come into existence in recent months. A similar situation exists in respect of the anomalous meanderings of the Kuroshio.

This list is not complete and illustrates the variety of effort which overlaps in some instances, but does not necessarily duplicate. Much of this effort may be regarded as experiments in methods of observing ocean climate from which standard techniques and observations will emerge for adoption. Effort which contributes to the development of better techniques should certainly continue. However, there exists no method of

linking these regional schemes of observation or any agency with the responsibility for doing so. Problems requiring a look at the whole ocean, as contrasted to viewing a piece of it are neglected thereby, and yet their comprehension may be critical to the solution of the regional problems for which these regional compilations of observations are intended to contribute. The broad view will not be possible until a means whereby data derived from the many regional sources can be entered as part of a common presentation.

A major problem then is the commitment of the responsibility for the compilation, analysis, and periodic issuance in a convenient form of the ocean climate data by a proper agency or agencies. This responsibility parallels that of a weather bureau but involves the ocean instead of the atmosphere. However, a considerable meteorological input is also required if the vagaries of the ocean climate are to be understood.

This should be done on a regional or national basis as a service for fisheries and other marine interests in the region concerned. If certain conventions in the manner of the compilation and display of the data could be agreed upon as a world standard as is true for meteorological synoptic maps, the regional maps could be combined into larger units for the use of those interested in more than the regional situation. Such users would certainly include those interested in developing predictions. The only observation that appears generally abundant enough for short-term synoptic maps is sea surface temperature, and even here there are areas where these observations are insufficient. Observations of other kinds could be added as the means for the collection, compilation, analysis, and publication of these results became better able to cope with these tasks and as observations of other kinds became sufficiently available. The precise nature of the time periods and publishing conventions used would require the attention of properly constituted working groups.

The use of the meteorological communications network for the transmission of oceanographic observations should be explored. This network does currently carry sea surface temperature observations as these are part of the reports from voluntary weather reporting ships. The recruitment of the larger, long-range fishing vessels as part of the fleet of voluntary weather reporting ships would provide observations for many portions of the ocean where such observations are few and would serve as an inducement to permit the addition of a few oceanographic observations to the material transmitted.

In Japan there are communication networks among the fishing vessels and a number of prefecture shore stations. These networks serve to provide sea-surface temperature and current fishing information to those vessels fishing in a given region and to receive, for purposes of compilation and transmission back to the fishing vessels, such information from the vessels. On a smaller scale, the mother ship of a fishing fleet will serve as an intelligence centre, relaying weather and catch information to the vessels of the fleet. An excellent resumé of these activities in Japanese fisheries is given by Terada 1962 (Geophysical Magazine, Vol. 31, No. 1, pp. 105-126).

The attention given to sea surface temperature is because of the abundance of these data as well as their intrinsic value as an indication of changes in the ocean. However, there are other kinds of data of as great or greater value in some circumstances. Data concerning measures of more than a single parameter, such as temperature and salinity for example, have the greatest potential value for these purposes. Among data other than sea surface temperatures are depth of the mixed layer; temperatures at certain depths such as 100, 200 or 50 meters; surface salinity; salinity at selected depths; water colour and turbidity; and current velocity and direction, to name a few. For some parameters their special utility in a given region may justify special efforts to provide means to obtain sufficient observations.

The utilization of the output from an international scheme for the rapid compilation, analysis and publication of synoptic oceanographic data would be largely and initially by scientists concerned with ocean climate, the processes that determine it, and its prediction. However, even on an empirical basis, much of value to fisheries should emerge. The major contribution would probably be the detection of major anomalies that

are extensive both in space and time. If the occurrence of a major anomaly warns of the possible reduction in availability of fish for a region, the fishing industry concerned should be provided with an understandable interpretation of the anomalous situation and an estimate of the reliability of the conclusions developed through its analysis. The responsibility for this aspect of the rapid utilization of oceanographic data could best, perhaps, be a regional one.

Within a region, the responsibility for the collection, compilation, analysis and dissemination of these data must be established. For those data taken routinely and more or less continuously, the meteorological communications network may be appropriate. Data from some fixed oceanographic station may require special channels. The dissemination of the analyses of these data to the fishing fleets could be by the same channels carrying maritime weather reports and to save time coded for broadcast. Where suitable equipment exists, the use of facsimile transmissions of synoptic maps would be useful. There are over 20 facsimile transmitting stations in existence and some of them transmit sea surface temperatures. Such facsimile charts may be useful for fishing vessels and the bigger longline tuna vessels of Japan, and other vessels are utilizing them.

The compilation and analysis should be by agencies competent to do this for the region concerned. The interpretation of synoptic oceanographic data in terms useful to fisheries requires much further research into the relationship between changes in the parameters measured and their effects on the fish, from which predictions may be developed.

### 1.1 Conclusion

Following is the summary of requirements for the rapid utilization of oceanographic data:

(a) On a regional basis the requirement of the fisheries for current synoptic oceanographic maps of ocean climate must be developed. This can best be done by regional working groups.

(b) To the degree that regional situations will permit, these maps of ocean climate should be compatible with those of other regions in the units of time and space employed for averaging and compiling the data. The attainment of compatible standards for these maps will require the attention of a properly constituted working group.

(c) The issuance of such maps should be the responsibility of regional or national agencies concerned with fisheries.

(d) The compilation of the regional synoptic maps into ocean-wide maps and maps of the world ocean for research and predictive purposes should be made possible by bringing regional boundaries into juxtaposition where possible.

(e) The synoptic maps should be interpreted in terms understandable and useful to fishermen. The accuracy of these interpretations and of predictions based on these maps will be as good as the understanding of the behaviour of the fish in response to changes in the ocean. This understanding requires much more research.

## 2. MATTERS CONCERNING THE INSTALLATION AND PROTECTION OF MOORED OCEANOGRAPHIC STATIONS

The ACMRR Working Group on Rapid Utilization of Synoptic Data and on Fixed Oceanographic Stations also considered and reported on the problems that the installation of moored oceanographic stations might present to fishermen. It also considered

the related problem of interference with such stations by fishermen and other users of the sea, whether intentional or otherwise.

The Committee noted with satisfaction that clause 3(g) of the "Conclusions on the marking of oceanographic stations", which is an Annex to Resolution A.50(III) of the Inter-Governmental Maritime Consultative Organization, already recommends the IOC to ensure the widest possible promulgation of information about such moorings, especially to fishing interests of the countries concerned. The Committee considered that clause 3(g) could have been made still more useful by inserting the words "and fishermen" after "mariners" in the first sentence in the first place where the word "mariners" occurs. Similarly, it thought that clauses 3(h) and 3(i) would have better served the interests of both fishermen and operators of moored stations if they had read as follows:

> 3(h) The IOC should recommend to the proper authorities that owners of moored stations use numbers or other inscriptions on the stations to facilitate identification and to discourage unauthorized handling of such stations, while still facilitating the eventual recovery of stations that may go adrift.
>
> 3(i) Care should be taken by authorities operating such stations to avoid obstructing fairways used by shipping, or areas where the moorings might interfere with fishing operations or be interfered with by such operations.

The Committee noted that sections 4(d), 4(e) and 4(f) of the Report of the IOC Working Group on Fixed Oceanographic Stations deal respectively with legal status of stations, distinctive marking and identification of stations, and safety precautions with regard to station equipment. These sections contain specific proposals about marking, identification. amd safety precautions which are, in the opinion of the Committee, in general satisfactory at present. They could be used as a basis for action under 3(h) and 3(i) above.

## 3. BIOLOGICAL DATA EXCHANGE

The Working Group on The Rapid Utilization of Synoptic Oceanographic Data and Fixed Oceanographic Stations was asked to consider whether arrangements should be made to store "fishery" data in a data centre.

The opinion of the Working Group was that the procedures of the World Data Centres, with regard to oceanographic data, were inappropriate for storage of fishery data in raw condition. One reason for this view was that much of fishery data is of relevance chiefly to individual stocks. Use of fishery data on global scale is practicable only when such data are reduced to some index or parametric form.

The Committee pointed out that FAO is engaged in a program with regard to fishery resources generally and in broad sense. The Committee considered that this program should include much that had been suggested to be necessary with regard to exchange of fishery data. The Committee considered that, for example, the need for a mechanism by which people could ascertain what work was being done in a particular field and where and how to obtain data from such work, could probably be met by FAO, and indeed FAO could act as a specialized centre for fishery data. In particular this centre should catalogue, and could also receive and store, data resulting from the experimental assessments of fishery resources, especially relevant data obtained from international cooperative expeditions.

It therefore recommended that FAO be requested to undertake this task of facilitating access to data on the distribution and abundance of marine resources.

However, the Committee was of the opinion that the best arrangement by which suitable processed data from fisheries research could be made accessible to all fishery researchers is that of national publications. To this arrangement can be added effectively the work of regional organizations, both in storage of special sets of data and in publication of such data in documents such as the ICES Statistical Newsletters and the ICNAF Sampling Yearbooks. Therefore, while recommending that FAO undertake the task of facilitating these exchanges, the Committee also recommended that governments and regional bodies be urged to intensify their efforts in this matter, and to assist FAO in this task.

The Committee emphasized that much had yet to be done for the intercalibration of fishery data, especially of catch per unit effort data. The Committee also drew attention to the extensive deficiencies still prevailing in catch and effort statistics and recommended that FAO intensify its efforts to assist governments to overcome these deficiencies.

The Committee recognized that development of uniform systems of statistical collection and compilation would take considerable time. It also recognized that standardization and intercalibration of other types of fishery data would be a protracted task, as would be the development of suitable systems of regional and global storage of selected sets of data. The Committee therefore considered that priorities should be set in this program, and whilst it would nominate the compilation and presentation in suitable atlas form of catch per unit effort data, including those coming from commercial operation, exploration, and research vessels, for highest priority, it considered that more careful examination of priorities should be made by the special working group.

The Committee had opportunity to study the draft report of the IOC Working Group on Oceanographic Data Exchange, which further illustrated the complexity of this problem. The Committee welcomed the cautious approach to this problem shown in Annex V of the draft report. It felt that this caution would be reinforced by practical biologists.

In view of the complexity of the problem, the Committee considered that a more detailed study of it would be required. It therefore recommended that a Working Party of ACMRR be set up to report and recommend to ACMRR on priorities in this task and to collaborate in respect of the general problems of biological data exchange with a counterpart group from SCOR should that Committee establish such a group.

ANNEX 1

AGENDA

1. Opening of the Session.

2. Election of Vice-Chairman.

3. Adoption of the Agenda.

4. Implementation of first session recommendations.

5. Discussion of Fisheries Division Program of Work for 1964-65 (including aspects of the Field Program 1965-66) and of specific items pertinent to marine resources research and management.

   5.1 Intelligence on Current Research activities (CBASF and other miscellaneous abstracts and documents; International Marine Science Newsletter).

   5.2 Synopsis of Information.
   5.3 Organization of Research, Education and Training (including manuals).
   5.4 Development, standardization and calibration of methods and instruments.
   5.5 Meetings (Symposium on the Effects of Environment on Fish Abundance and Distribution; World Meeting on Biology and Culture of Shrimps; Symposium on Dynamic Models for Marine Communities).
   5.6 Development and assistance in Stock Assessment (including statistics for research purposes; methods for direct measurement of abundance).
   5.7 Other projects (Assessment of Sardinella resources in the Gulf of Guinea).

6. Coordination and cooperation with other bodies; discussion of specific items (including projects requiring joint action).

   6.1 FAO regional fisheries councils and commissions.
   6.2 Other regional and fisheries bodies (CCTA, IWC, ICES, ICNAF, etc.).
   6.3 UNESCO and other UN agencies.
   6.4 ICSU (International Biological Program: Productivity of Marine Communities).
   6.5 SCOR (General Scientific Framework for World Ocean Study; Abstracts and Documentation. Standardization and Intercalibration of Methods).

7. Matters concerning IOC (requests for advice; proposals).

   7.1 Development of a General Scientific Framework for the Comprehensive Study of World Ocean - IOC/2/Res.2.
   7.2 Speedy Utilization of Synoptic Oceanographic Data - IOC/2/Res.14.
   7.3 Development of Fixed Oceanographic Stations and Protection of these installations - IOC/2/Res.17.
   7.4 Standardization and intercalibration of oceanographic techniques and methods - IOC/2/Res.19.
   7.5 Biological Data Exchanges - IOC/2/Res.20.
   7.6 International oceanographic cooperative investigations (IIOE, ICITA, SACI, CSK) - IOC/2/Res.3,5,6,7,11,12.
   7.7 Second International Oceanographic Congress.
   7.8 Other proposals and new suggestions.

8. Stimulating and assisting research in particular fields (marine resources improvement; methods of identifying sub-populations).

9. Guide lines for future programs (Twelfth Session of the Conference; Resolution on Fisheries Development).

10. Data and place of the Third Session of ACMRR.

11. Election of Officers for the next year.

12. Other business.

13. Adjournment.

ANNEX 2

DIRECTOR-GENERAL'S OPENING ADDRESS TO SECOND SESSION
OF ADVISORY COMMITTEE ON MARINE RESOURCES RESEARCH

Mr. Chairman, Gentlemen:

It is little more than a year since under the authority of the FAO Council I decided to establish this Advisory Committee to consider our work in the field of marine resources research, and to advise me on the implementation of our current program and the formulation of future ones.

The results of the First Session of this Committee, held early in 1963, and the activities of your Working Groups since then, have confirmed my view that this action was indeed opportune. It was with the recommendations of this Committee in mind that I put to the 12th Session of the FAO Conference in November last the proposals of the Director of the Fisheries Division for an expansion of work in 1964/65. These proposals were within the general lines I had put forward for expansion of the work of the Organization as a whole, especially in the field of appraisal of natural resources and research for economic development. They included, for example, provision for the activities of Working Groups of regional fisheries bodies, as well as of this Committee itself, and other items to which you had made specific reference in the Report of your First Session. I am very glad to be able to say now that not only did the Conference accept these proposals - and, of course this is very important, approve the necessary budget for their implementation - but the Conference went even further than this. The Conference in fact emphasized that even with the modest expansion I had proposed, the staff and budgetary provision for the Fisheries Division's work were still not adequate for the great tasks before it.

I have been able to see a way by which during the present biennium the Division can be strengthened in its work on the assessment of exploited stocks of fish and of other marine animals. I believe such work has a higher urgency now than ever before in view of the tremendous development of the techniques of exploitation and in certain cases their unrestricted application to give high catches now, but at the expense of long-term sustained yields. I should like to give you an example. Scientists have reported recently on the status of the whale stocks of the Antarctic. They recommended a very drastic reduction in the amount of whaling so that these stocks can recover and give substantial and continued yields in the future. Yet we are now in the middle of a whaling season during which yet again more whales will be taken than the present stocks can support. Results so far reported from the Antarctic this year are confirming the scientists' gloomy view of the situation. I have called the attention of countries - members of the International Whaling Commission - to this situation, and I believe that this Organization must endeavour to put its whole weight, that of its member countries collectively, to get recognition and acceptance, not only in principle but also in practice, of the concept that the food resources of the sea, which are the common property of mankind, must be maintained not only for present profit but for future generations. I believe FAO has this responsibility by virtue of its constitution and by reference also to the Geneva Conventions concerning the fisheries of the High Seas and the Continental Shelf.

It is not necessary for me to emphasize that we are interested in the protection of whales, or indeed of other exploited stocks, primarily as resources to be used, and used well. But conservation is only one aspect of our interest in these resources. Many - probably most - marine resources are not yet fully exploited. Many are not yet exploited at all, and surely even the existence of many more is not yet known. FAO then has the task of assisting its member countries to search for new resources and to appraise known ones. Such search and appraisal could at this time be made more rational in the light even of our present fragmentary scientific knowledge of the oceans. Exploration should,

and must eventually, be planned if the sea is to provide the greatly increased supplies of animal proteins that the world's human population needs. This is a question both of technique and of organization.

I am told instruments are becoming available now which will permit - and perhaps quite soon - more efficient and rapid appraisal of the abundance of fish stocks. At the same time current technological research will, we hope, lead to fuller utilization of a wider range of types of marine resources. I expect that FAO will play a leading part at the international level in promoting these activities. At the level of organization I see an important role of this Organization in promoting more intensive regional activity through fisheries councils and commissions, and at the world level as providing a means to facilitate coordination of the regional fisheries activities, and also their integration with other programs of oceanic exploration, survey and research. I am particularly happy therefore that together here in this room are scientists associated with the various regional fisheries bodies, and others connected particularly with the Intergovernmental Oceanographic Commission.

I should mention at this point the role of this Committee as advisory body to the Intergovernmental Oceanographic Commission, and to take this opportunity of offering a special welcome to the two scientists here from the Soviet Union, who were appointed on the recommendation of the Bureau of the Commission.

The Intergovernmental Oceanographic Commission has not met since the First Session of this Committee, but your Recommendations were transmitted to the Bureau of the Commission, as well as to the Scientific Committee on Oceanic Research and to regional fisheries bodies. Meanwhile your Working Groups on matters of direct interest to the Commission have been active and I am sure that in its Recommendations to the Third Session of the Commission later this year, this Committee will prove its competence to advise that body on scientific and technical aspects of its projects, as they relate to the living resources of the seas.

As you know, the Intergovernmental Oceanographic Commission is established under UNESCO, but has several formal links with FAO. During the past year our cooperation with UNESCO on many marine science matters has been consolidated. It is my hope that in this way we may be able to offset, at least partially, the inherent disadvantages in the Commission having been established under only one of the several UN Agencies which have programs in one or other part of the whole field of marine science.

I was particularly happy that last week this Organization was host to the International Commission for the North-west Atlantic Fisheries, which held its long-planned Symposium on Environmental Research here in Rome. Unfortunately, I was away from Rome at the time and thus was not able to attend any of its Sessions, but my staff in the Biology Branch of the Fisheries Division assure me that not only was this a Symposium of the highest scientific interest, but also that the discussions during it had a most important and direct bearing on the work of this Organization in what has broadly been called "fisheries oceanography". I refer here not only to what we call our Regular Program, but to the orientation of our expanding field programs, by which we are assisting member countries to conduct research on a sound continuing basis, and to appraise the data coming from such research as the foundation for well conceived fisheries development and management programs.

I have mentioned conservation problems and also the exploration and appraisal of unused and under-used resources. I hope also that you will not forget the positive aspects of improvement of resources, and even perhaps the creation of new stocks by transplantation, which might become possible in the not too remote future. We hear a lot these days about "farming the seas" in the popular and in the scientific press.

We know also that there are several prerequisites for such a development. Among these prerequisites are first a detailed and quantitative knowledge of the dynamic biological processes in the sea and the pathways by which the sun's energy and the nutrients in the sea water become converted into materials of use to man. The second prerequisite is a real conquest of the sea, in the sense of a great development and application of techniques and equipment for exploiting and controlling the sea. The third prior need is the existence of a regime of international control of exploitation to ensure that the fruits are plucked only when they are ripe, and that seed is set aside for the future. In some ways the prospects of actually increasing the sea's resources provide intellectually the most exciting problems, and I hope that you will be able to give me some guidance as to how FAO can play its part in this coming fisheries revolution.

In concluding, I would like to refer again to the Resolution of the FAO Conference. While recognizing the Organization's present budgetary limitations, the Conference called for a reappraisal of the Fisheries Division's program, referring particularly to its work in connection with marine resources. This reappraisal could lead to new measures which could make this Organization in future years the leading intergovernmental body in encouraging rational harvesting of food from the oceans. I would welcome your suggestions on this matter in relation to our present work in the field of research, exploration, conservation and the improvement of resources.

I wish you every success in your deliberations.

ANNEX 3

STATEMENT BY DR. D.B. FINN
TO THE SECOND SESSION OF ACMRR

Mr. Chairman and Gentlemen:

This is a new experience for me. For about 18 years whenever I spoke to a meeting of this kind, I spoke as representing the Director-General. Before then I was a Deputy Minister and had to be even more careful. Now I represent nobody but myself. It is rather a nice feeling to speak and to know that I am not committing or embarrassing any Organization by any statement that I make. I feel highly honoured to be invited to be present and I hope you, Mr. Chairman, will allow me to sit very quietly at some of your meetings merely to observe what my old friends are saying and thinking.

The Fisheries Division has already felt the effect of this Committee's deliberations. I am sure that had it not been formed, had it not examined the FAO's Program of Work in marine fisheries science and formulated the various needs, the Fisheries Division would not have got as far as it did at the last Conference - not that it has, in my own view, gone far enough - but a start has been made. It was a difficult Conference, but I think that it was the best one I have attended. One of the signs of progress is that in Commission II of the 12th Session of the Conference, Resolution No. 8/3, the operative clauses of which are:

> "Requests that the Director-General prepare, for consideration by the Council and the 13th Session of the Conference, proposals outlining measures which can be taken to assure that FAO, through its Fisheries Division, has in future years the status of being the leading intergovernmental body in encouraging rational harvesting of food from the oceans and inland waters, bearing in mind the dynamic relationship between the living aquatic resources and the environment and also bearing in mind the importance of fisheries in providing needed animal protein;
>
> Also requests that means for carrying out the proposals which are to be outlined by the Director-General take into account resources not only under the Regular Program budget but also from all other possible sources;
>
> Further requests the Council to consider the status of the Fisheries Division in order to determine how the fisheries activities could be given full recognition in the Organization and among other international bodies that concern themselves with matters related to fisheries".

Still another sign of progress is the authorization to establish a Stock Assessment Unit. This will be of great use, not only for the fisheries councils and commissions established under the auspices of FAO, but to other intergovernmental fisheries bodies. I hope that once this Unit is functioning suitable arrangements can be made to render this service.

I know you need no review of fisheries development. You have been responsible for so much of it. But it might be useful to sketch the nature of the problems and some of the forces that I see operating in the situation. After all, this is the background against which governments and international organizations and this Committee must work.

Reduced to its simplest terms, the situation has two elements. The first is the nature of the fishing itself. The second is the living resource and its response to man's exploitation.

Modern fishing is a fiercely competitive hunt. The hunters, and their skill, increase daily. We see the competition between State enterprises and private national

enterprises, which also compete among themselves. In the past costs and efficiencies were not the limiting factors for State enterprises. For private enterprises, profits are the limiting factor, but costs and efficiencies have not really been measured. For all competitors, costs and efficiencies are more a matter of feeling based on experience than a matter of real measurement.

Recently FAO has been cooperating in the use of computers which make it possible to analyse the effects of dozens of variables in the fishing operation to compare different combinations of them and to measure efficiencies.

Our first work was concerned in the design of the best lines for fishing vessels for particular fisheries in certain parts of the sea. While there is still more to be done, certain successes have been achieved which will largely eliminate time-consuming and expensive tank tests. What formerly took months and cost $4,000 to $5,000 can be done in hours for $100 to $200.

The next step is to examine the positioning of equipment on board boats for particular fisheries. This includes examining the type of gear and its operation. This will be combined with an attempt to determine the "personal equation" of the crew, particularly of the skipper and the mates. Next it is planned to use the computer in economic analysis of distribution and marketing and to find out which of the many methods now in use is likely to be most efficient under variable circumstances.

So there is now in train a whole series of efforts, the net result of which will make decision-making easier and the operation more predictable. This, in turn, will reduce risks in this highly risky enterprise. If these risks are reduced, it will result in increasing the flow of capital to the industry. If this happens, fishing effort will become more and more effective.

Private enterprise in fishing tends to become more oligopolistic, if not outrightly monopolistic. Although this may increase efficiency and make possible a better use of capital, it does nothing to relieve the competition between countries for the spoils of the chase. In fact, it may make it worse. Nor does increased efficiency in catching per se do anything to produce wiser cropping or to achieve maximum yield. Under such regimes, the yield of the sea may be far below its potential production. This is because the yields per unit of effort will probably fall under the intense competition and with the application of more efficient methods. Eventually only the most efficient private expeditions will be able to make fishing pay. This is not necessarily true for State operated expeditions which may be able to disregard costs as a matter of government policy.

It is likely that effective agreements toward wise resource management between nations would be harder to achieve. This is because industrial combines in any one country result in more effective political pressure, in gaining government concessions. Numerous unorganized small individual enterprises in the same country cannot effectively exert this kind of pressure.

The failure of the International Whaling Convention, particularly as it affected the survival of the blue whale, is one example. The result is that the blue whale is now economically extinct.

It seems to me that the world is now on its way to this state of affairs at a rapidly increasing pace. This will influence the second element that I have mentioned; the way the resource responds to man's exploitation. Unrestricted efficient exploitation may add to knowledge of the stocks. Providing proper statistics are kept, it may illustrate whether particular resources could be exterminated either actually or economically by actually doing it.

By comparison of the yields under such a regime with those obtained previously under less intense efforts, it might be possible to estimate how much fish food has been wasted in a world which is, and will become, more and more hungry for animal protein.

However, this is only half the story. What of the resource itself? How can we say with any degree of confidence what is probable until we are in a better position to describe with reasonable accuracy the size of the resource and to indicate the likely response to different degrees of intensity of fishing? Until we can say more about this, it is very unlikely that the arguments for wise exploitation will be very convincing. It is here that the challenge lies for the fisheries scientists; it is here where the greatest urgency prevails.

It is an immensely complicated task, one which requires intense national and international effort, and one which requires a smooth combination and coordination of effort.

Look at the groups now working at this task: ICES, ICNAF, NORPAC, ICSU, IPFC, GFCM, UNESCO, IOC, IIOE, EQUALANT, IATTC, WAFC, CARPAS, WMO, CSK, and others. With such multiplicity, one can imagine what a tremendous task it would be to achieve a "smooth coordination of effort".

Another vital part that fisheries scientists can play is the actual augmenting of the sea resources. You are all familiar with the technical possibility of a four to fivefold increase in the yields of plaice on the Dogger Banks. You all know that the limiting factor is the difficulty in achieving agreements among nations that it should be done. Such work will undoubtedly be possible with other kinds of fish. Further increases might be possible by transplanting certain species from an ecological environment in the Northern Hemisphere to a similar one in the Southern Hemisphere, or from one ocean to another.

In addition we have the, as yet, unexplored possibilities, for some species at least, of the application of genetics, selected breeding, and fish culture in certain areas of the sea. Each achievement in this research moves us closer to truly "farming the sea". Such research might be both purely national and international. Here again a new set of problems will arise which require coordination and spreading of information.

It is here that FAO must play its part. The extent to which it can play this part will be determined by the design of its organization, the relationships FAO can establish, the money that it can command, and the caliber of the individuals who undertake the work.

So far I have spoken of some of the things that concern what we call the Regular Program of the Biology Branch. They, of course, have more than this on their Regular Program. I have not dealt with the other Branches at all. They would have a similar list of tasks centering on leadership and coordination. I have not said anything about our field work, such as in EPTA, UN Special Fund, UNICEF, Trust Funds, and Freedom from Hunger Campaign which you know require a lot of time and energy. When one regards the total load and considers that it is growing daily, it can be seen that the present structure and design of the Fisheries Division is inadequate.

The world - and especially the fisheries world - is not what it was from 1943 to 1945. It was in those years that our role, the basis for our operation, and the design of our structure were decided. This structure and organizational design served us pretty well in that simpler world of the early days. But it is no longer able to function efficiently in this more complex modern age with its breath-taking rapidity of growth.

Much careful thought must be given to the nature of the tasks which, up to now, we have performed. The money and manpower available are by no means adequate even to keep up with first priorities, which really could take much more than we are able to give. The result has been that the very fine staff that the Organization possesses has been much over-extended.

The Director-General will present a submission to the next Conference as a result of the Resolution which was passed by the last. I hope this submission will be sufficiently bold and imaginative to enable FAO's work eventually to meet the demands

of its member governments. The fulfilment of a bold plan to reorganize our fisheries work, as envisaged in the Resolution, will take perhaps from four to six years. It is very important that the lines be drawn with an eye to the future role which the Organization must play, even though the process of accomplishment will be gradual.

It has been extremely pleasant for me to have been associated with FAO from the very beginning and to have seen the work develop thus far. As I have indicated we, in fisheries, are facing a renaissance such as occurred during the agricultural revolution a hundred years ago. I think and hope that member governments will recognize this when they consider the new plans which I expect the Director-General will present.

I am sure that the role of this, and similar Committees, will become more and more important and significant as problems become more difficult, and as fisheries work in FAO grows. I feel it must grow or atrophy. Even though I am no longer officially part of the Organization, I hope that I can still help in this growth. It is to this and to fisheries development generally that I shall devote my newly-found freedom.

ANNEX 4

LIST OF INFORMATION PAPERS

ACMRR/2/IP.1 Documents concerning Exchange of Biological Data (Comments from FAO, SCOR and Dr. Ronald Currie).

ACMRR/2/IP.2 Aide Memoire of Meeting of Consultant Group on the Preparation of a Series of Leaflets on Statistical Methods in Fisheries Biology, 17-19 December 1963, FAO, Fisheries Division, Biology Branch.

ACMRR/2/IP.3 General Fisheries Council for the Mediterranean, Report - 7th Session (Madrid-March 1963).

(Sup.1) CONFERENCE - Twelfth Session (Technical Committee on Fisheries). Report of the General Fisheries Council for the Mediterranean to the Twelfth Session of the Conference for the Period 1 May 1961 to 1 July 1963.

ACMRR/2/IP.4 FAO Program of Work and Budget for 1964-65.

ACMRR/2/IP.5 SCOR Statement on the General Scientific Framework for the Comprehensive Study of the World Ocean.

ACMRR/2/IP.6 International Biological Programme. Report to the Sub-Committee on "Productivity of Marine Communities" by R.S. Glover.

ACMRR/2/IP.7 International Biological Programme. Sub-Committee on Productivity of Marine Communities. First Report to the IBP Planning Committee.

ACMRR/2/IP.8 Scientific Aspects of Guinean Trawling Survey. Revised Version by F. Williams (Director, GTS).

ACMRR/2/IP.9 CONFERENCE - Twelfth Session (Technical Committee on Fisheries). Opening Statement by the Director.

ACMRR/2/IP.10 CONFERENCE - Twelfth Session. The Work of FAO 1962-63. Report of the Director-General.

ACMRR/2/IP.11 CONFERENCE - Twelfth Session. Supplement to Program of Work and Budget. Summary List of Activities proposed for 1964-65 (Note by Director-General).

ACMRR/2/IP.12 CONFERENCE - Twelfth Session (Technical Committee on Fisheries). Report of the Indo-Pacific Fisheries Council to the Director-General of the Food and Agriculture Organization of the United Nations.

ACMRR/2/IP.13 CONFERENCE - Twelfth Session. Report of the Technical Committee on Fisheries.

ACMRR/2/IP.14 Intergovernmental Oceanographic Commission. Report of the Second Session of the Commission (UNESCO, Paris, 20-28 September 1962).

ACMRR/2/IP.15 International Biological Programme. Report of the Planning Committee, 15th November, 1963.

ACMRR/2/IP.16 IOC Bureau and Consultative Committee. Summary Report of the 2nd Meeting (Moscow, 6-8 May 1963). Summary Report of the 3rd Meeting (Paris, 28-31 October 1964).

ACMRR/2/IP.17 Comments of SCOR President to UNESCO concerning the International Biological Programme.

ACMRR/2/IP.18 Extracts from Provisional Report of the Twelfth Session of the Conference. Rome, 16 November to 5 December 1963.

ACMRR/2/IP.19 Fisheries Aspects of IIOE. Some preliminary notes prepared by Dr. D.N.F. Hall and the IOC Secretary.

ACMRR/2/IP.20 National Oceanographic Data Center. A preliminary list of items for use for biological cards.

(Sup.1) National Oceanographic Data Center. Models for Biological Cards.

ACMRR/2/IP.21 FAO Working Party for Rational Utilization of Tuna Resources in the Atlantic Ocean. First session, FAO, Rome, 25-30 October 1963.

ACMRR/2/IP.22 Document entitled "Attached is a draft proposal for the 1965-66 biennium for a regional fisheries training project under EPTA".

ACMRR/2/IP.23 Various documents on matters concerning Abstracts and Bibliographies in Marine Science.

ACMRR/2/IP.24 UN Advisory Committee on the Application of Science and Technology to development. Note on FAO's activities related to the application of science and technology to development.

ACMRR/2/IP.25 Extracts from Report - SCOR Executive Meeting, Paris, October 25-26, November 2, 1963.

ACMRR/2/IP.26 IOC Draft Report on Working Group on Oceanographic Data Exchange 2nd Meeting, Paris, 27-30 January 1964.

ACMRR/2/IP.27 Organization of Fisheries Research (Agenda item 5.3).

ANNEX 5

LIST OF WORKING PAPERS

ACMRR/2/WP.1 Provisional Agenda.

ACMRR/2/WP.2 (Rev.2) List of Participants.

ACMRR/2/WP.3 (Rev.1) List of Working Papers.

ACMRR/2/WP.4 (Rev.1) List of Information Papers.

ACMRR/2/WP.5 A General Scientific Framework for Fisheries Science by D. Cushing, Convener of ACMRR Working Group on GSF.

(Sup.1) Aide Memoire on Discussions concerning the GSF (4 and 5 December, Lowestoft) by D. Cushing and H. Rotschi.

(Sup.2) Report of Working Group on Fisheries Aspects of the General Scientific Framework for World Ocean Study.

ACMRR/2/WP.6 (Rev.1) Report of the Working Group on the Rapid Utilization of Synoptic Oceanographic Data and Fixed Oceanographic Stations, by Vernon E. Brock, Convener.

(Sup.1) Report of the Working Group on the Rapid Utilization of Synoptic Oceanographic Data and Fixed Oceanographic Stations.
Part II - Matters concerning the Installation and Protection of Moored Oceanographic Stations.

(Sup.2) Report of the Working Group on the Rapid Utilization of Synoptic Oceanographic Data and Fixed Oceanographic Stations.
Part III - Biological Data Exchange.

ACMRR/2/WP.7 Marine Resources Research in the S.W. Atlantic, Argentina, Brazil and Uruguay by V. Angelescu, Special Rapporteur for ACMRR on the South Atlantic Cooperative Investigations.

ACMRR/2/WP.8 The International Cooperative Investigations of the Tropical Atlantic by Vernon E. Brock, Special Rapporteur for ACMRR on ICITA.

ACMRR/2/WP.9 Some thoughts on the Improvement of Marine Resources by David Cushing.

ACMRR/2/WP.10 Outline of a Project for Appraising the Resources of Sardinella, and other Small Clupeoid Fishes in the Gulf of Guinea, prepared by Fisheries Division, FAO (Biology Branch, and Secretariat of West African Fisheries Commission).

ACMRR/2/WP.11 The International Standard Statistical Classification of Aquatic Animals and Plants (ISSCAAP), with a special reference to the Further Breakdown of its Groups and Divisions according to Species Items.

ACMRR/2/WP.12 Fishing Areas for Statistical Purposes in the North, Central and South Atlantic Regions.

ACMRR/2/WP.13 A Framework for the International Biological Program on the Productivity of Marine Communities by S.J. Holt (FAO).

ACMRR/2/WP.14 Symposium on Dynamic Models for Marine Communities by Secretariat.

ACMRR/2/WP.15 Summary Report to ACMRR of the Meeting of Marine Science Experts on the Kuroshio Region, (Tokyo, 29-31 October 1963) by M. Uda, Special Rapporteur for ACMRR.

(Sup.1) Additional Information Regarding the Cooperative Investigation Program for the Kuroshio Survey by Kiyo Wadati, International Coordinator, Cooperative Study of the Kuroshio and Adjacent Regions.

ACMRR/2/WP.16 Report of the First Session. Advisory Committee on Marine Resources Research. Rome, 28 January - 2 February 1963.

ACMRR/2/WP.17 Action of UNESCO and IOC Secretariat following the first meeting of ACMRR, by UNESCO and IOC Secretariat.

ACMRR/2/WP.18 Note on World Scientific Meeting on the Biology and Culture of Shrimps and Prawns prepared by H. Rosa, Jr., FAO, Fisheries Division, Biology Branch.

ACMRR/2/WP.19 Note on the Synopses on the Biology of Species of Living Aquatic Organisms prepared by H. Rosa, Jr., FAO, Fisheries Division, Biology Branch.

ACMRR/2/WP.20 Annual Review of Marine Science.

ACMRR/2/WP.21 Director-General's Opening Address to Second Session of Advisory Committee on Marine Resources Research.

ACMRR/2/WP.22 International Indian Ocean Expedition by N.K. Panikkar, Special Rapporteur for ACMRR on IIOE.

ACMRR/2/WP.23 List of Documents and of Recommendations Pertinent to Agenda Items.

ACMRR/2/WP.24 Statement by Dr. D.B. Finn to the Second Session of ACMRR.

ACMRR/2/WP.25 Meteorology and Oceanography for fishermen by S.J. Holt, FAO, Chief, Fisheries Biology Branch.

ACMRR/2/WP.26 Conclusions and Recommendations of the Second Session.

ACMRR/2/WP.27 Introduction to the General Discussion on Matters Concerning IOC, by K.N. Fedorov, Secretary of IOC.

ANNEX 6

LIST OF PARTICIPANTS

Members of ACMRR

| | |
|---|---|
| Mr. John N. ADJETEY | Director<br>Fisheries Division<br>Ministry of Agriculture<br>P.O. Box 630<br>Accra, Ghana |
| Dr. Arkadi P. ALEKSEEV | Director<br>Polar Research Institute of<br>Marine Fisheries and Oceanography<br>Knipovichstr. 6<br>Murmansk, U.S.S.R. |
| Dr. Wilbert M. CHAPMAN | President<br>Van Camp Foundation<br>739 Golden Park Avenue<br>San Diego 6, California, U.S.A. |
| Prof. Walerian CIEGLEWICZ | Morski Instytut Rybacki<br>Aleja Zjednoczenia 1<br>Gdynia, Poland |
| Dr. David CUSHING | Fisheries Laboratory<br>Lowestoft, Suffolk, England |
| Dr. Jean FURNESTIN* | Directeur<br>Institut Scientifique et Technique<br>des Pêches Maritimes<br>59 Avenue Raymond-Poincaré<br>Paris XVI, France |
| Prof. Francisco GNERI | Universidad de Buenos Aires<br>División de Biología Animal y Vegetal<br>Facultad de Ciencias Exactas y Naturales<br>Florida 656, 3er Piso<br>Buenos Aires, Argentina |
| Dr. Gotthilf HEMPEL | Institut für Hydrobiologie und<br>Fischereiwissenschaft<br>Olbersweg 24<br>Hamburg-Altona 1, Federal Republic of<br>Germany |
| Dr. Georgi K. IZHEVSKY | All-Union Research Institute of<br>Marine Fisheries and Oceanography<br>Ulitsa Krasnoselskaya 17<br>Moscow B-140, U.S.S.R. |

* Absent

| | |
|---|---|
| Dr. Geoffrey L. KESTEVEN | Assistant Chief<br>Marine Biological Laboratory (CSIRO)<br>Box 21<br>Cronulla, New South Wales, Australia |
| Dr. Cyril E. LUCAS | Director<br>Marine Laboratory<br>Department of Agriculture and Fisheries for Scotland<br>Victoria Road<br>Torry<br>Aberdeen, Scotland |
| Mr. Donald L. McKERNAN | Director<br>Bureau of Commercial Fisheries<br>Fish and Wildlife Service<br>Department of the Interior<br>Washington 25, D.C., U.S.A. |
| Dr. Aldred W.H. NEEDLER | Deputy Minister of Fisheries<br>Department of Fisheries<br>Sir Charles Tupper Building<br>Confederation Heights<br>Ottawa, Canada |
| Dr. N. Kesava PANIKKAR | Director<br>Indian Programme<br>International Indian Ocean Expedition<br>Council of Scientific and Industrial Research, CSIR Building<br>Kafi Marg<br>New Delhi, India |
| Dr. Henri ROTSCHI | Chef<br>Laboratoire d'Océanographie Physique de l'Institut Français d'Océanie<br>c/o ORSTOM<br>Rue Bayard 24<br>Paris, France |

## Members of ACMRR Working Groups

### Working Group on the General Scientific Framework for World Ocean Study

Dr. David CUSHING
(Convener)

Dr. N. Kesava PANIKKAR

Dr. Henri ROTSCHI

Working Group on Rapid Utilization of Synoptic Data and on Fixed Oceanographic Stations

| | |
|---|---|
| Mr. Vernon E. BROCK (Convener) | Director<br>Hawaii Marine Laboratory<br>University of Hawaii<br>Honolulu 14, Hawaii |
| Dr. Maurice BLACKBURN | Scripps Institution of Oceanography<br>University of California<br>La Jolla, California, U.S.A. |
| Dr. Jens EGGVIN | Chief<br>Fiskeridirektoratet<br>Havsforskingsinstitutt<br>Nordnesparken 2<br>Bergen, Norway |
| Prof. Michitaka UDA | Tokyo University of Fisheries<br>Shiba Kaigan-dori<br>Minato-ku<br>Tokyo, Japan |

Working Group on the International Biological Program (FAO members)

Dr. David CUSHING

Dr. N. Kesava PANIKKAR

Representatives and Observers of International Organizations

IBP

| | |
|---|---|
| Mr. Roland S. GLOVER (Convener) | Subcommittee on Productivity of Marine Communities<br>Scottish Marine Biological Association<br>Oceanographic Laboratory<br>78 Craighall Road<br>Edinburgh 6, Scotland |

SCOR

| | |
|---|---|
| Prof. Trygve BRAARUD | Institutt for Marin Biologi. B<br>University of Oslo<br>Oslo 3, Blindern, Norway |

UNESCO and IOC

| | |
|---|---|
| Dr. Konstantin N. FEDOROV | Director<br>Office of Oceanography<br>Department of Natural Sciences<br>UNESCO<br>2 Place de Fontenoy<br>Paris VII, France |

UNESCO

| | |
|---|---|
| Dr. Timothy R. PARSONS | Office of Oceanography<br>Department of Natural Sciences<br>UNESCO<br>2 Place de Fontenoy<br>Paris VII, France |

Guest

| | |
|---|---|
| Dr. D.B. FINN | Retired Director, FAO Fisheries Division |

Food and Agriculture Organization

| | |
|---|---|
| Dr. B.R. SEN | Director-General |
| Mr. F.E. POPPER | Deputy Director, Fisheries Division |
| Mr. S.J. HOLT | Chief, Fisheries Biology Branch |
| Dr. M. RUIVO | Chief, Research Programs Section<br>Fisheries Biology Branch |
| Mr. E.F. AKYUZ | Biologist, Research Programs Section<br>Fisheries Biology Branch |
| Mr. H. ROSA, Jr. | Chief, Marine Resources Section<br>Fisheries Biology Branch |
| Mr. J.G. SIMPSON | Biologist, Marine Resources Section<br>Fisheries Biology Branch |
| Dr. K. TERADA | Fisheries Oceanographer<br>Fisheries Biology Branch |
| Mr. L.P.D. GERTENBACH | Chief, Statistics Section<br>Fisheries Economics Branch |

FAO Consultant

| | |
|---|---|
| Mr. Basil B. PARRISH | Department of Agriculture and Fisheries<br>for Scotland<br>Marine Laboratory<br>Victoria Road<br>Torry<br>Aberdeen, Scotland |

## Secretariat of the Committee

| | |
|---|---|
| Secretary: | Dr. M. Ruivo |
| Administrative Assistant: | Miss M.C. de Freitas |
| Assistants: | Mrs. R. Caparrucci<br>Miss S. de Friston<br>Miss E. Malcolm<br>Miss G. Misserville<br>Mrs. H. Montaner<br>Miss E. Ronchetti<br>Mr. R. Berardi |

## ANNEX 7

### RESOLUTION NO. 8/63 ON FISHERIES DEVELOPMENT OF THE 12TH SESSION OF THE CONFERENCE

THE CONFERENCE

Realizing that the most pressing need in human nutrition is to make available to people in all parts of the world an adequate supply of high-quality protein such as that derived directly from animals,

Noting that whereas there are great difficulties in rapidly increasing supplies of animal protein in many parts of the world, the oceans and inland waters offer exceptional possibilities for meeting this urgent need,

Observing that world fisheries production has doubled within the past decade and that opportunities exist for comparable increases in the next several decades,

Noting the increased attention which has been given in recent years to the rational exploitation of the living resources of the oceans and inland waters by national and international governmental and non-governmental bodies concerned with research, management and development,

Emphasizing that wasteful duplication in international fishery work can be avoided only if all efforts are properly coordinated,

Recognizing the constitutional responsibility of FAO in this field, and the increasingly important role that the Fisheries Division should play in the rational use of aquatic resources in order to supply food needed for the world, and

Realizing the limited attention which the Fisheries Division has been able to give to this responsibility,

Requests that the Director-General prepare, for consideration by the Council and the Thirteenth Session of the Conference, proposals outlining measures which can be taken to ensure that FAO, through its Fisheries Division, has in future years the status of being the leading intergovernmental body in encouraging rational harvesting of food from the oceans and inland waters, bearing in mind the dynamic relationship between the living aquatic resources and the environment and also bearing in mind the importance of fisheries in providing needed animal protein;

Also requests that consideration of the means for carrying out the proposals which are to be outlined by the Director-General should take into account resources not only under the Regular Program budget but also from all other possible sources; and

Further requests the Council to consider the status of the Fisheries Division in order to determine how the fisheries activities could be given full recognition in the Organization and among other international bodies that concern themselves with matters related to fisheries.

(Adopted 4/12/63)

6. When the Sardinella shoals are dispersed they are not easily registered and enumerated by echo sounder. By the use of lights they can be congregated and echo sounders used to measure the size and density of the congregations, hence combined light and echo sounders offer a means of systematically surveying these stocks.

7. At present countries having marine research programs and which have a Sardinella fishery (Ghana and Ivory Coast) include Sardinella work in their programs. Ghana gives some priority to this but the time of neither the research vessel nor of the limited staff can be devoted entirely to Sardinella studies. On the other hand, some countries, e.g. Sierra Leone, with no fishery and few facilities, are interested in participating to some extent in a survey of Sardinella stocks having in mind that the introduction of light fishing techniques opens up the possibility of their exploitation. These facts suggest the form of a useful project which would combine certain characteristics of the GTS with those of the ICITA surveys. In the Guinean Trawling Surveys two trawlers have been chartered for a year and a Survey Director appointed, the trawlers being manned by scientific staff drawn from African countries and other participating countries, and in addition to these, interested African countries have offered certain facilities. There is little, if any, coordination, however, between the work of the two trawlers and that of the African research vessels. Under Equalant, vessels of interested countries are making expeditions in a coordinated but unplanned way; different ships are making different observations and following tracks which together do not make a regular or comprehensive pattern of coverage of the area. Our suggestion for a Sardinella survey would be that one, or perhaps two, boats be chartered for a minimum of two years to chart the Sardinella resources in the area from Sierra Leone to Pointe Noire. The vessel or vessels should be fitted with appropriate echo sounder and lights and should be capable of ring netting. Each vessel would be manned by a scientific staff of perhaps two biologists and would, as necessary, take on staff temporarily from the various interested countries. At the same time arrangements would be made to coordinate the survey with the Sardinella research programs of the particular countries.

8. We have in mind a project which would result in a map of the Sardinella resources and information about their potential yield, but would at the same time provide important opportunities for training in marine resources survey methods (especially the use of echo sounders for this purpose) and demonstration of light fishing. It would therefore be necessary for such a project to have rather liberal provision for fellowships, both on board the survey vessels and for overseas training. The project would certainly also provide information on the behaviour of the Sardinella especially in reaction to light and the opportunity would be taken to make some determination of the population characteristics of the Sardinella to carry out tagging (this is most important because of lack of knowledge of stock identity) and to take plankton samples for eggs. In the latter connection a prior requirement is the examination of the egg data from ICITA, both from the point of view of locating Sardinella shoals not detected by fishing or by echo sounder and also to give information about spawning periods which are important because they are related in the presently fished areas to upwelling time and vulnerability.

9. A suitable project would last about four years:- one year for preparation, two for ships' operations and one final year for analysis and interpretation of results. The preparatory year would be used also for gathering information about the present Sardinella fisheries, including the catches by big trawlers.

10. Such a project should not be concerned exclusively with Sardinella but also with other small pelagic fishes in the same area of distribution. These and the Sardinella have an important significance not only for human consumption but also as bait fish resources in the developing tuna fisheries. In addition pertinent oceanographic observations would be made, including study of associations of plankton with fish distribution and differential light effects. Necessary light experiments would be conducted in the laboratory as well as at sea. The scientific staff might also give courses and other forms of training, not only on board the vessels but in the participating countries in turn.